Federal Publications on Alternative and Innovative Treatment Technologies For Corrective Action and Site Remediation

Fourth Edition

Prepared by the Member Agencies of the
Federal Remediation Technologies Roundtable:

U.S. Environmental Protection Agency
Department of Defense
- U.S. Air Force
- U.S. Army
- U.S. Navy

Department of Energy
Department of Interior
National Aeronautics and Space Administration
Tennessee Valley Authority
Coast Guard

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NOTICE

This document has been funded by the United States Environmental Protection Agency under Contract 68-W2-004. It has been subject to administrative review by all agencies participating in the Federal Remediation Technologies Roundtable, and has been approved for publication. Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

FOREWORD

This bibliography provides a list of titles and ordering information for publications on innovative technology development and demonstration issued by member agencies of the Federal Remediation Technologies Roundtable. This bibliography is meant to improve access to information on innovative technologies and assist in the coordination of ongoing research initiatives to develop and implement innovative technologies for corrective action and site remediation. The bibliography focuses on innovative technologies that provide for the treatment of hazardous wastes, and contains neither information on non-treatment alternatives such as landfilling and capping, nor information on more conventional treatment technologies, such as incineration and solidification. Inclusion of a resource in this publication is based on the ability to identify, locate, and order the document.

The Roundtable was established in 1990 as an interagency committee to exchange information and provide a forum for joint action regarding the development and demonstration of innovative technologies for hazardous waste remediation. Roundtable member agencies expect to complete many site remediation projects in the near future. They recognize the importance of documenting the results of these projects and making the information available to anyone interested in innovative technology development.

The bibliography is organized by media or technology type, and it is further categorized by the issuing Agency. Information on ordering listed publications can be found at the end of the bibliography.

Walter W. Kovalick, Jr., Ph.D.
Chairman
Federal Remediation Technologies Roundtable

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PREFACE

The Federal Remediation Technologies Roundtable (Roundtable) has prepared this bibliography to publicize the availability of Federal documents pertaining to innovative and alternative technologies to treat hazardous wastes. The last edition of the bibliography was published in 1993.

This updated edition contains references for documents and reports from the U.S. Environmental Protection Agency (EPA), the U.S. Army, the U.S. Navy, the U.S. Air Force, the U.S. Department of Energy (DOE), and the U.S. Department of Interior (DOI). Publications appearing for the first time in this edition are denoted with an asterisk. The Roundtable obtained reference information from a variety of sources:

- Federal Agency reports, project and publication lists from EPA, the Naval Civil Engineering Laboratory, the U.S. Army Environmental Center, the U.S. Army Engineer Waterways Experiment Station, the Air Force Engineering and Sciences Center, DOE, and DOI; and

- the National Technical Information Service (NTIS) and other data bases.

This bibliography includes technologies that provide for the treatment of hazardous wastes; therefore, it does not contain information or references for containment or other non-treatment strategies, such as landfilling and capping. This bibliography emphasizes innovative technologies for which detailed cost and performance data are not readily available. Information on more conventional treatment technologies, such as incineration and solidification, is not included.

In addition to improving access to information on innovative technologies, the Roundtable hopes this bibliography will assist in the coordination of ongoing research initiatives and increase the development and implementation of these innovative technologies for corrective action and site remediation. This bibliography is intended as a starting point in your pursuit of information on innovative alternative hazardous waste treatment technologies and should not be considered all-inclusive. In the last chapter of this document (page 48), you will find instructions for ordering the publications cited.

This bibliography is a joint effort of the Roundtable member agencies, and is revised periodically. Therefore, if your agency has produced any publications on innovative remediation technologies that should be included in future versions of this bibliography, or if you have any suggestions for improving this document, please complete the suggestion form on page 50 and return it to: **Naomie Smith, Technology Innovation Office, U.S. Environmental Protection Agency (5102W), 401 M Street, SW, Washington, DC 20460**.

A. CONFERENCES AND INTERNATIONAL SURVEYS

EPA

* ● *Approaches for Remediation of Federal Facility Sites Contaminated With Explosives or Radioactive Waste*.
EPA/625/R-93/013

● *Assessment of International Technologies for Superfund Applications: Technology Review and Trip Report Results*.
EPA/540/2-88/003

● *Assessment of International Technologies for Superfund Applications: Technology Identification and Selection*.
EPA/600/2-89/017

* ● *Biological Remediation of Contaminated Sediments, with Special Emphasis on the Great Lakes: Report of a Workshop*.
EPA/600/9-91/001

● *Forum on Innovative Hazardous Waste Treatment Technologies, Domestic and International, (Abstract Proceedings)*.
(First Forum, Atlanta, GA), EPA/540/2-89/055; NTIS: PB90-268509
(Second Forum, Philadelphia, PA), EPA/540/2-90/009; NTIS: PB91-145649
(Third Forum, Dallas, TX), EPA/540/2-91/016; NTIS: PB92-233881
(Fourth Forum, San Francisco, CA), EPA/540/R-92/081

* ● *International Workshop in Pesticide Treatment/Disposal/Waste Minimization*.
EPA/600/9-91/047; NTIS: PB92-119940

● *NATO/CCMS Project — International Evaluation of In Situ Biorestoration of Contaminated Soil and Groundwater*.
EPA/540/2-90/012

● *NATO/CCMS Project — Demonstration of Remedial Action Technologies for Contaminated Land and Groundwater*.
Proceedings are maintained in the Hazardous Waste Collection, EPA Headquarters Library, Washington, DC

* ● *NATO/CCMS Pilot Study — Evaluation of Demonstrated and Emerging Technologies for the Treatment and Clean Up of Contaminated Land and Groundwater (Phase II)*. Interim Status Report. Number 203. May 1995.
EPA/542/R-95/006

● *Proceedings of the Symposium on Soil Venting.*
EPA/600/R-92/174; NTIS: PB93-122323

* ● *Remedial Action, Treatment, and Disposal of Hazardous Waste: Proceedings of the 20th Annual RREL Hazardous Waste Research Symposium*.
EPA/600/R-94/011; NTIS: PB94-159092

● *Residual Radioactivity and Recycling Criteria: Workshop Proceedings.*
EPA 520/1-90/013; NTIS: PB91-179119

● *Second International Conference on New Frontiers for Hazardous Waste Management: Proceedings of a Conference Held in Pittsburgh, PA, Sept. 27-30, 1987*.
EPA/600/9-87/018F

* ● *Summary Proceedings-Northeast Remediation Marketplace: Business Opportunities for Innovative Technologies*.
EPA/542/R-94/001; NTIS: PB94-154770

* ● *Summary Proceedings-Rocky Mountain Remediation Marketplace: Business Opportunities for Innovative Technologies*.
EPA/542/R-94/006

* ● *Summary Proceedings-West Coast Remediation Marketplace: Business Opportunities for Innovative Technologies*.
EPA/542/R-94/008

● *Third International Conference on New Frontiers for Hazardous Waste Management: Proceedings of a Conference Held in Pittsburgh, PA, Sept. 10-13, 1989*.
EPA/600/9-89/072

* ● *Workshop on Removal, Recovery, Treatment, and Disposal of Arsenic and Mercury*.
EPA/600/R-92/105; NTIS: PB92-216944

DOE

● *Bioremediation of Mercury-Contaminated Sites: Foreign Trip Report, Sept. 9-17, 1989*. Turner, R.R. Oak Ridge National Laboratory, DOE, TN. Sept. 1989.
ORNL/FTR-3393; NTIS or OSTI: DE90001248

B. TECHNOLOGY SURVEY REPORTS

EPA

* ● *Abstracts of Remediation Case Studies*
EPA/542/R-95/001

● *A Compendium of Technologies Used in the Treatment of Hazardous Waste*.
EPA/625/8-87/014

* ● *An Overview of UST Remediation Options*
EPA/510/F-93/029

● *Approaches for Remediation of Uncontrolled Wood Preserving Sites.*

EPA/625/7-90/011

- *Assessing Detoxification and Degradation of Wood Preserving and Petroleum Wastes in Contaminated Soil*. April, W., *et al*. Waste Management & Research. 8(1): 45-65. Feb. 90.
  EPA/600/J-90/009; NTIS: PB90-243275

- *Assessment of International Technologies for Superfund Applications — Technology Identification and Selection*.
  EPA/600/S2-89/017

- *Assessment of Technologies for the Remediation of Radioactively Contaminated Superfund Sites*.
  EPA/540/2-90/001; NTIS: PB90-204140

- *Behavior of Metals in Soils*.
  EPA/540/S-92/018; NTIS: PB93-131480

- *Cleaning Up the Nation's Waste Sites: Markets and Technology Trends*.
  EPA/542-R-92/012; NTIS: PB93-140762

- *Compendium of Costs of Remedial Technologies at Hazardous Waste Sites*.
  EPA/600/S2-87/087

- *Contaminants and Remedial Options at Wood Preserving Sites*.
  EPA/600/R-92/182; NTIS: PB92-232222

- *Engineering Bulletin: Control of Air Emissions from Materials Handling During Remediation*.
  EPA/540/2-91/023

- *EPA Workshop on Radioactively Contaminated Sites*.
  EPA/520/1-90/009; NTIS: PB90-227950/AS

- *General Methods for Remedial Operation Performance Evaluation*.
  EPA/600/R-92/002

* - *Groundwater Treatment Technologies Resource Guide*
  EPA/542/B94/009; NTIS: PB95-138657

- *Guidance on Remedial Action for Superfund Sites with PCB Contamination*.
  EPA/540/G-90/007; NTIS: PB91-921206

* - *Guide to Documenting Cost and Performance for Remediation Projects*
  EPA/542/B-95/003

- *Guide to Treatment Technologies for Hazardous Wastes at Superfund Sites*. Office of Environmental Engineering and Technology Demonstration, U.S. EPA. Mar. 1989.
  EPA/540/2-89/052; **NTIS: PB 89-190821/XAB**

- *Handbook on In Situ Treatment of Hazardous Waste-Contaminated Soils*.
  EPA/540/2-90/002; NTIS: PB90-155607

- *Handbook: Stabilization Technologies for RCRA Corrective Action.*
  EPA/625/6-91/-2C; NTIS: PB92-114495

* - *How to Evaluate Alternative Cleanup Technologies For Underground Storage Tank Sites: A Guide For Corrective Action Plan Reviewers*
  EPA/510/B-94/003

- *Innovative Operational Treatment Technologies for Applications to Superfund Sites*.
  EPA/540/2-90/006; NTIS: PB90-202656
  EPA/540/2-90/004 (Nine Case Studies)

- *Innovative Processes for Reclamation of Contaminated Subsurface Environments*. Canter, L.W., *et al*.
  EPA/600/2-90/017; NTIS: PB 90-199514

* - *Innovative Treatment Technologies: Annual Status Report, Sixth Edition*
  EPA/542/R-94/005; NTIS: PB95-138152

- *Innovative Treatment Technologies: Overview and Guide to Information Sources, October 1991*.
  EPA/540/9-91/002; NTIS: PB92-179001

- *In Situ Restoration Techniques for Aquifers Contaminated with Hazardous Wastes*. Lee, M.D., *et al*. Journal of Hazardous Materials. Elsevier Science Publishers B.V. Amsterdam, The Netherlands. 14:71-82. 1987.
  EPA/600/J-87/032; NTIS: PB87-198396

- *Literature Survey of Innovative Technologies for Hazardous Waste Site Remediation: 1987-1991*. July 1992.
  EPA/542/B-92/004

- *Mobile Treatment Technologies for Superfund Wastes*.
  EPA/540/2-86/003f

- *On-Site Treatment of Creosote and Pentachlorophenol Sludges in Contaminated Soil*.
  EPA/600/2-91/019; NTIS: PB91-223370

- *PCB (Polychlorinated Biphenyl) Sediment Decontamination, Technical/Economic Assessment of Selected Alternative Treatments: Final Report, Jun. 1985-Feb. 1986*. Carpenter, B.H. Hazardous Waste Engineering Research Laboratory, U.S. EPA, Cincinnati, OH. Dec. 1986.
  EPA/600/2-86/112

* - *Physical/Chemical Treatment Technology Resource Guide*
  EPA/542/B-94/008

- *Procuring Innovative Technologies at Remedial Sites: Q's and A's and Case Studies*.
  EPA/542/F-92/012

* - *Remediation Case Studies: Bioremediation*
  EPA/542/R-95/002; NTIS: PB95-182911

* - *Remediation Case Studies: Groundwater Treatment*
  EPA/542/R-95/003; NTIS: PB95-182929

* - *Remediation Case Studies: Soil Vapor Extraction*
  EPA/542/R-95/004; NTIS: PB95-182937

* - *Remediation Case Studies: Thermal Desorption, Soil Washing, and In Situ Vitrification*
  EPA/542/R-95/005; NTIS: PB95-182945

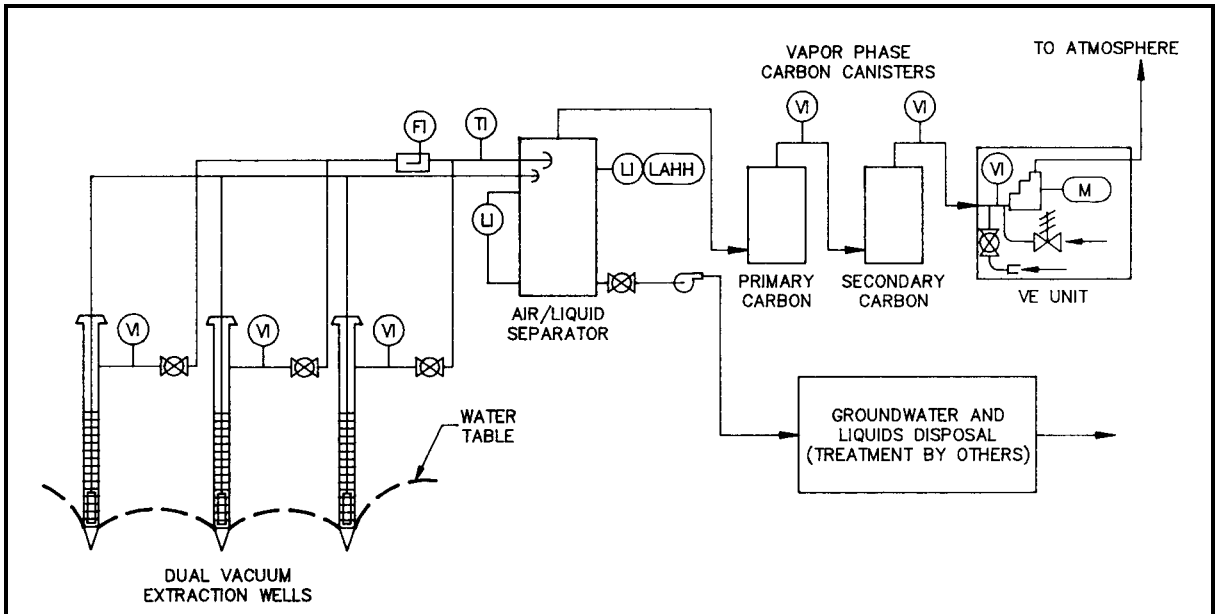
- *Remediation of Contaminated Sediments*.
  EPA/625/6-91/028

- *Remediation of Sites Contaminated with TCE*.
  EPA/600/J-91/030; NTIS: PB91-182311

* - *Remediation Technologies Screening Matrix and Reference Guide: Second Edition*
  EPA/542/B-94/013; NTIS: PB95-104782

- *Report on Decontamination of PCB-Bearing Sediments*. Wilson, D.L. Hazardous Waste Engineering Research Laboratory, U.S. EPA, Cincinnati, OH. Oct. 1987.
  EPA/600/2-87/093

- *Review of In-Place Treatment Techniques for Contaminated Surface Soils. Volume I. Technical Evaluation.*



In Situ Vacuum Extraction Process

EPA/540/2-84/003a

- *Selection of Control Technologies for Remediation of Lead Battery Recycling Sites*.
  EPA/540/2-91/014; NTIS: PB92-114537

- *Seminar Publication — Corrective Actions: Technologies and Applications*.
  EPA/625/4-89/020

* - *Soil Vapor Extraction Treatment Technology Resource Guide*
  EPA/542/B-94/007

- *Subsurface Contamination Reference Guide*.
  EPA/540/2-90/011; NTIS: PB91-921292

- *Summary of Treatment Technology Effectiveness for Contaminated Soil: Final Report*.
  EPA/540/2-90/002

- *Superfund Engineering Issue—Treatment of Lead Contaminated Soils*.
  EPA/540/2-91/009; NTIS: PB91-921291

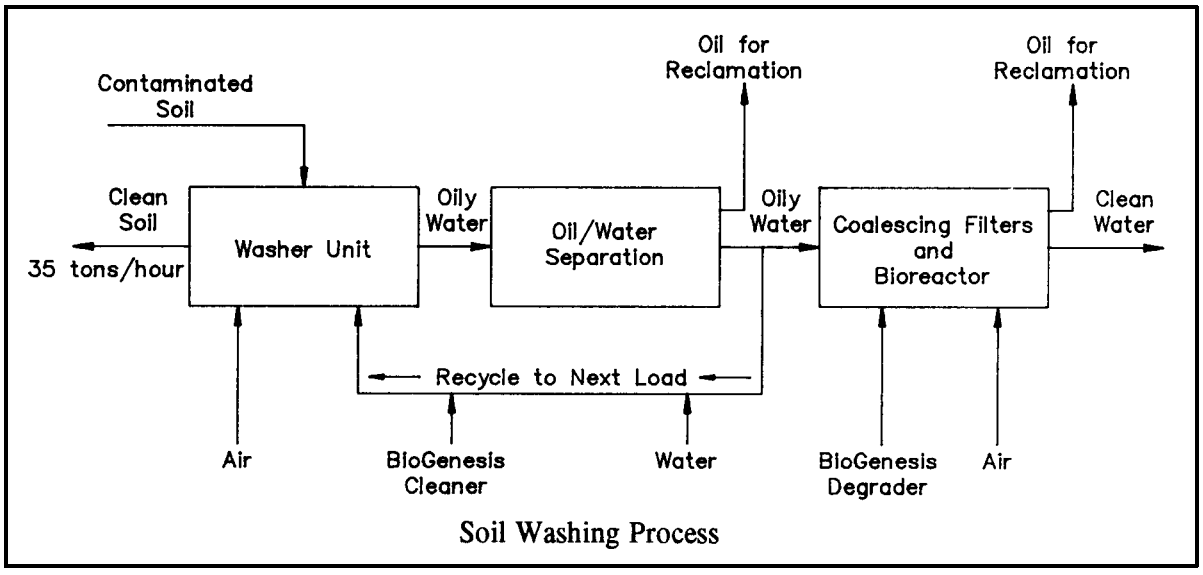
- *Superfund Innovative Technology Evaluation (SITE) Program* — Brochure.
  EPA/540/8-89/010

- *Superfund Innovative Technology Evaluation Program* — SITE Program Fact Sheet.
  OSWER Directive 9330.1-03FS

* - *The Superfund Innovative Technology Evaluation Program: Technology Profiles, Seventh Edition*
  EPA/540/R-94/526

- *Superfund Treatability Clearinghouse Abstracts*.
  EPA/540/2-89/001; NTIS: PB90-119751

- *Survey of Materials-Handling Technologies Used at Hazardous Waste Sites*.
  EPA/540/2-91/010; NTIS: PB91-921283



Soil Washing Process

- *Technical Resource Document: Treatment Technologies for Halogenated Organic Containing Wastes*. Volume I.
  EPA/600/2-87/098

- *Technological Approaches to the Cleanup of Radiologically Contaminated Superfund Sites*.
  EPA/540/2-88/002; NTIS: PB89-122121

- *TCE Removal from Contaminated Soil and Ground Water*.
  EPA/540/S-92/002; NTIS: PB92-224104

- *Technologies and Options for UST Corrective Actions: Overview of Current Practice*.
  EPA/542/R-92/010

- *Technologies for In Situ Treatment of Hazardous Wastes*. Sanning and Lewis. Hazardous Waste Engineering Research Laboratory, U.S. EPA, Cincinnati, OH. Jan. 1987.
  EPA/600/D-87/014; NTIS: PB87-146007/XAB

- *Technologies of Delivery or Recovery for the Remediation of Hazardous Waste Sites*.
  EPA/600/S2-89/066; NTIS: PB90-156225

- *Technology Screening Guide for Treatment of Soils and Sludges*.
  NTIS: PB 89-132674

- *Treatment of Lead-Contaminated Soils*.
  EPA/540/2-91/009

- *Treatment Potential for 56 EPA Listed Hazardous Chemicals in Soil*. Sims, R.C., *et al.* 1988.
  EPA/600/6-88/001; NTIS: PB89-174446

- *Treatment Technology Background Document*. Berlow and Vorbach. Office of Solid Waste, U.S. EPA, Washington, DC. Jun. 1989.
  EPA/530/SW-89/048A; NTIS: PB89-221410/XAB

- *Workshop on Innovative Technologies for Treatment of Contaminated Sediments, June 13-14, 1990, Summary Report*.
  EPA/600/S2-90/054

DOE

* ● *Applied Research and Development Private Sector Accomplishments: Final Summary Report*. Beskid, N.J., *et al*. 1993.
  NTIS: DOE/CH-9303

- *Demonstrations of Technology for Remediation and Closure of Oak Ridge National Laboratory Waste Disposal Sites*. Spalding, B.P., *et al*. Oak Ridge National Laboratory. Sept. 1989.
  NTIS: ORNL/TM-11286; or OSTI: DE90001854

* ● *Electrokinetic Treatment of Contaminated Soils, Sludges, and Lagoons*. Office of Technology Development. 1992.
NTIS: DOE/CH-9206

* ● *Innovation Investment Area: Technology Summary*. Office of Environmental Management; Office of Technology Development. Mar. 1994.
NTIS: DOE/EM-0146P

* ● *In Situ Remediation Integrated Program: Technology Summary*. Office of Environmental Management; Office of Technology Development. Feb. 1994.
NTIS: DOE/EM-0134P

* ● *Mixed Waste Integrated Program: Technology Summary*. Office of Environmental Management; Office of Technology Development. Feb. 1994.
NTIS: DOE/EM-0125P

● *Treatability of Hazardous Chemicals in Soils: Volatile and Semivolatile Organics*. Walton, B.T., *et al*. Oak Ridge National Laboratory. Jul. 1989.
NTIS: ORNL-6451; or OSTI: DE89016892 (Also available from EPA, Ada, OK)

* ● *VOCs in Non-Arid Soils Integrated Demonstration: Technology Summary*. Office of Environmental Management; Office of Technology Development. Feb. 1994.
NTIS: DOE/EM-0135P

U.S. Air Force

● *Remedial Technology Design, Performance, and Cost Study.* U.S. Air Force Center for Environmental Excellence, Brooks AFB, Texas. July 1992.

U.S. Army

* ● *An Assessment of Selected Enhancement Techniques in Electrokinetic Remediation of Inorganic Species*. Acar, Y., *et al*. I&EC Special Journal, American Chemical Society, Vol. I, Sept. 1993.

● *Guidelines for Selecting Control and Treatment Options for Contaminated Dredged Material Requiring Restrictions: Final Report*. Cullinane, M.J., *et al*. U.S. Army Corps of Engineers Waterways Experiment Station. Sept. 1986.
No published document number.

* ● *Heavy Metal Soil Contamination at U.S. Army Installations: Proposed Research and Strategy for Technology Development*. Bricka, R.M., *et al*. U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS. March 1994.
TR-IRRD-94-1

● *Installation Restoration and Hazardous Waste Control Technologies*. 1990 Edition. U.S. Army Environmental Center. Aug. 1990.
CETHA-TS-CR-90067

- *Proceedings from the 15th Annual Army Environmental R&D Symposium*. U.S. Army Environmental Center. Jun. 1991.
  CETHA-TS-CR-91076

- *Review of Removal, Containment and Treatment Technologies for Remediation of Contaminated Sediment in the Great Lakes*. Averett, D.E., *et al*. U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS. 1990.
  WES: MP-90-25

* - *Technical Approach for In Situ Biotreatment Research: Bench-Scale Experiments*. Zappi, M.E., *et al*. U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS. 1993.
  TR-IRRP-93-3

* - *Technology Assessment of Currently Available and Developmental Techniques for Heavy Metals-Contaminated Soils Treatment*. Bricka, R.M., *et al*. U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS. 1993.
  WES: IRRP-93-4

U.S. Navy

* - *Environmental Cleanup Technology Transfer Initiatives*. Muehlhausen, L.A. Naval Facilities Engineering Service Center, Port Hueneme, CA. August 1994.
  NFESC: TR-2023-ENV

C. TREATABILITY STUDIES

EPA

- *Conducting Treatability Studies Under RCRA.*
  OSWER Directive 9380.3-09 (Fact Sheet); NTIS: PB92-963501

- *Groundwater and Leachate Treatability Studies at Four Superfund Sites*.
  EPA/600/2-86/029

- *Guide for Conducting Treatability Studies Under CERCLA: Aerobic Biodegradation Remedy Screening*.
  EPA/540/2-91/013 A&B; NTIS: PB92-109065 and PB92-109073

- *Guide for Conducting Treatability Studies Under CERCLA: Chemical Dehalogenation*.
  EPA/540/R-92/013 A&B; NTIS: PB92-169044 and PB92-169275

- *Guide for Conducting Treatability Studies Under CERCLA: Soil Vapor Extraction*.
  EPA/540/2-91/019 A&B

- *Guide for Conducting Treatability Studies Under CERCLA: Soil Washing*.
  EPA/540/2-91/1020 A&B; NTIS: PB92-170570 and PB92-170588

- *Guide for Conducting Treatability Studies Under CERCLA: Solvent Extraction*.
  EPA/540/R-92/016 A; NTIS: PB92-239581

- *Guide for Conducting Treatability Studies Under CERCLA, Update*.
  EPA/540/R-92/017A

- *Inventory of Treatability Study Vendors, Volume I*.
  EPA/540/2-90/003a; NTIS: PB91-228395

- *Results of Treatment Evaluations of Contaminated Soils*. Esposito, P., *et al*. Hazardous Waste Engineering Research Laboratory, U.S. EPA, Cincinnati, OH. Aug. 1988.
  EPA/600/D-88/181

- *Treatability of Hazardous Chemicals in Soils: Volatile and Semi-Volatile Organics*.
  NTIS: DE89-016892

- *Treatability Potential For EPA Listed Hazardous Wastes in Soil*. Loehr, R.C.
  EPA/600/2-89/011 (Available from EPA, Ada, OK); NTIS: PB 89-166581

- *Treatability Potential for 56 EPA Listed Hazardous Chemicals in Soil*.
  EPA/600/6-88/001 (Available from EPA, Ada, OK); NTIS: PB 89-174446

- *Treatability Studies Under CERCLA: An Overview, 12/89*.
  OSWER Directive 9380.3-02FS (Fact Sheet); NTIS: PB90-273970

U.S. Army

* - *Chemical Extraction of Heavy Metals from Contaminated Soils*. Bastain, C., *et al*. I&EC Special Journal, American Chemical Society, Vol. II. September 1993.

* - *Electrokinetic Remediation: Basics and Technology Status*. Acar, Y., *et al*. Journal of Hazardous Materials, Vol. 39, No. 3. 1994.

* - *Enhancement Techniques in Electrokinetic Remediation*. Acar, Y., *et al*. Journal of Geotechnical and Geoenvironmental Engineering. (In Review). 1993.

- *Treatability of Ninth Avenue Superfund Site Groundwater*. Zappi, M.E., *et al*. U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS. 1991.
  WES: EL-91-8

* - *Use of Activated Carbon for the Treatment of Explosive-Contaminated Groundwater at Picatinny Arsenal*. Bricka and Fleming. U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS. 1995.
  No published document number (in publication).

* - *UV/Chemical Oxidation Treatment of RDX Contaminated Waters at Picatinny Arsenal*. Fleming, E., *et al*. U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS. 1995.
  WES: EL-95-7

D. GROUNDWATER

Three-quarters of the hazardous waste sites across the U.S. include groundwater contamination. The conventional *ex situ* approach to groundwater remediation at most sites is to determine the source and extent of aquifer contamination, drill a number of extraction and injection wells, pump out contaminated groundwater for treatment (air stripping, activated carbon filter, *etc*.), and reinject clean water until the aquifer meets applicable standards. Groundwater remediation is often complicated by hydrogeologic features such as fractured media and the attributes of certain contaminants like dense non-aqueous phase liquids (DNAPLs) that are difficult to recover and treat. Most pump-and-treat remedies, even under ideal conditions, can take decades of operation and maintenance, depending on the extent of contamination and contaminant characteristics. For this reason, most innovative groundwater technologies provide a time-saving alternative that either enhances the performance and efficiency of conventional pump-and-treat systems (*e.g.*, surfactants, co-solvents) or replaces it with an *in situ* remedy (*e.g.*, biorestoration, biorecovery).

EPA

- *Biorestoration of Aquifers Contaminated with Organic Compounds*.
  EPA/600/J-88/-78; NTIS: PB89-103527

- *Chemical Enhancements to Pump-and-Treat Remediation*.
  EPA/540/S-92/001 (Available from EPA, Ada, OK); NTIS: PB92-180074

- *Contaminant Transport in Fractured Media: Models for Decision Makers (Issue Paper)*.
  EPA/540/4-89/004 (Available from EPA, Ada, OK); NTIS: PB92-268517

- *Considerations in Groundwater Remediation at Superfund Sites and RCRA Facilities—Update*.
  OSWER Directive 9283.1-06; NTIS: PB92-963358

- *Critical Evaluation of Treatment Technologies with Particular Reference to Pump-and-Treat Systems*.
  EPA/600/A-92/224; NTIS: PB93-119857

- *Dense Nonaqueous Phase Liquids — A Workshop Summary*.
  EPA/600/R-92/030 (Available from EPA, Ada, OK); NTIS: PB92-178938

- *Emerging Technology Report — Biorecovery Systems Removal and Recovery of Metal Ions from Ground Water*.
  EPA/540/5-90/005a (Evaluation Report); NTIS: PB90-252594
  EPA/540/5-90/005b (Data and Supporting Information); NTIS: PB90-252602

- *Estimating Potential for Occurrence of DNAPL at Superfund Sites*.
  EPA Publication 9355.4-07FS (Available from EPA, Ada, OK); NTIS: PB92-963338

- *Evaluation of Ground Water Extraction Remedies*.
  NTIS: PB90-18358 (Vol. 1, Summary Report)
  PB90-274440 (Vol. 2, Case Studies [Interim Final])
  PB90-274457 (Vol. 3, General Site Data, Data Base Reports [Interim Final])

* - *Evaluation of Technologies For Cleanup of DNAPL Contaminated Sites*
  EPA/600/R-94/120; NTIS: PB94-195039

- *Facilitated Transport (Issue Paper)*.

EPA/540/4-89/003 (Available from EPA, Ada, OK); NTIS: PB91-133256

- *Fundamentals of Ground Water Modeling*.
  EPA/540/S-92/005; NTIS: PB92-232354

- *Ground Water Issue: Dense Nonaqueous Phase Liquids*.
  EPA/540/4-91/020A (Available from EPA, Ada, OK); NTIS: PB91-195974

- *Ground Water Issue: Evaluation of Soil Venting Application*.
  EPA/540/S-92/004; NTIS: PB92-235605

- *Ground Water Issue: Reductive Dehalogenation of Organic Contaminants in Soils and Ground Water*.
  EPA/540/4-90/054 (Available from EPA, Ada, OK); NTIS: PB91-191056

* - *Ground Water Treatment Technology Resource Guide*
  EPA/542/B-94/009

- *Guidance on Remedial Actions for Contaminated Ground Water at Superfund Sites*.
  EPA/540/G-88/003; NTIS: PB89-184618

- *In Situ Aquifer Restoration of Chlorinated Aliphatics by Methanotrophic Bacteria*.
  EPA/600/2-89/033; NTIS: PB219992

- *In Situ Bioremediation of Contaminated Ground Water*.
  EPA/540/S-92/003; NTIS: PB92-224336

- *In Situ Treatments of Contaminated Ground Water: An Inventory of Research and Field Demonstrations and Strategies for Improving Ground Water Remediation Technologies*.
  EPA/500/K-93/001

- *Opportunities for Bioreclamation of Aquifers Contaminated with Petroleum Hydrocarbons*.
  EPA/600/J-87/133; NTIS: PB88-148150

- *Performance Evaluations of Pump-and-Treat Remediations*. (Issue Paper).
  EPA/540/4-89/005 (Available from EPA, Ada, OK); NTIS: PB92-114461

- *Pump-and-Treat Ground Water Remediation Technology*.
  EPA/540/2-90/018; NTIS: PB91-921356

* - *Status Reports on In Situ Treatment Technology Demonstration and Applications:*

Thermal Enhancements	**EPA/542/K-94/002**
Surfactant Enhancements	**EPA/542/K-94/003**
Treatment Walls	**EPA/542/K-94/004**
Hydrofracturing/Pneumatic Fracturing	**EPA/542/K-94/005**
Cosolvents	**EPA/542/K-94/006**
Electrokinetics	**EPA/542/K-94/007**
Altering Chemical Conditions	**EPA/542/K-94/008**

- *TCE Removal from Contaminated Soil and Ground Water*.

EPA/540/S-92/002; NTIS: PB92-224104

* ● *Technology Evaluation Report: Accutech Pneumatic Fracturing Extraction and Hot Gas Injection, Phase I*
EPA/540/R-93/509; NTIS: PB93-216596

DOE

* ● *Bench-Scale Demonstration of a Bioreactor System to Treat Chlorinated Volatile Contaminants in Groundwater*. Office of Technology Development. 1992.
NTIS: DOE/CH-9207

* ● *A Process for Contaminant Removal and Waste Volume Reduction to Remediate Groundwater Containing Certain Radionuclides, Toxic Metals, and Organics*. Office of Technology Development. 1992.
NTIS: DOE/CH-9201

* ● *Remediation of Groundwater Containing Radionuclides, Heavy Metals, Inorganic Ions, and/or Organics Using the AlgaSORB™ Biosorbent System*. Office of Technology Development. 1992.
NTIS: DOE/CH-9212

U.S. Army

* ● *Compatibility of Ninth Avenue Superfund Site Groundwater with Two Soil-Bentonite Slurry Wall Backfill Mixtures*. Zappi, M.E., *et al*. U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS. 1990.
WES: EL-90-9

E. THERMAL PROCESSES

Innovative thermal treatment technologies include processes that go beyond simple "burn units." *In situ* thermal processes include thermally enhanced soil vacuum extraction (SVE) and vitrification. SVE is a physical treatment technology described below. **Vitrification** uses an electric current to melt soil or sludge at extremely high temperatures (1,600°C to 2,000°C), destroying organic pollutants by pyrolysis. *Ex situ* techniques add thermal desorption and other enhanced incineration techniques to the list. **Thermal desorption** includes physical separation processes that do not destroy contaminants directly but rather heat waste to volatilize and contaminants for treatment.

EPA

- *Applications Analysis Report: Babcock & Wilcox Cyclone Furnace Vitrification Technology*.
EPA/540/AR-92/017

- *Applications Analysis Report: Horsehead Resource Development Company, Inc., Flame Reactor Technology*.
  EPA/540/A5-91/005

- *Applications Analysis Report: Retech, Inc., Plasma Centrifugal Furnace*.
  EPA/540/A5-91/007

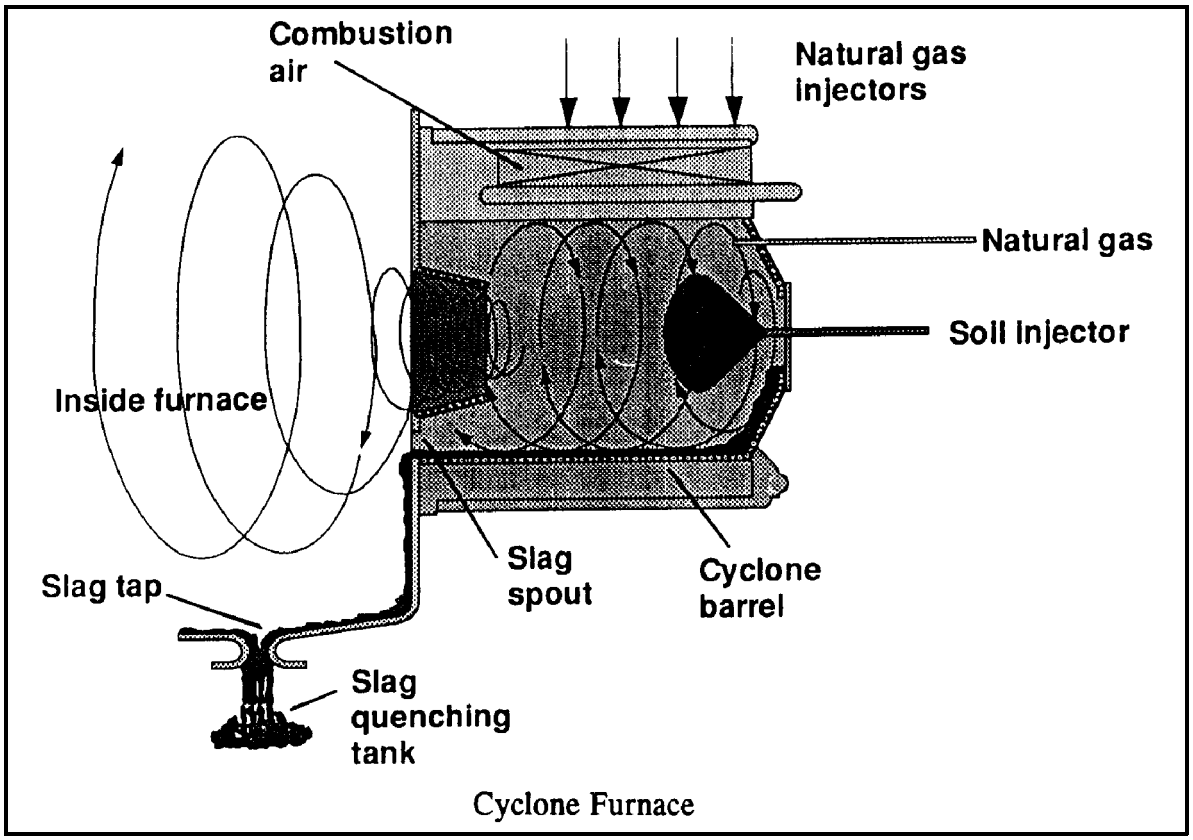
* - *Application Analysis Report: Roy F. Weston, Inc.-Low Temperature Thermal Treatment System*.
  EPA/540/AR-92/019; NTIS: PB94-124047

* - *Applications Analysis Report: Thermal Desorption Unit, Eco Logic International, Inc.*
  EPA/540/AR-94/504

- *Demonstration Bulletin: AOSTRA-SoilTech Anaerobic Thermal Processor: Wide Beach Development Site*.
  EPA/540/MR-92/008

* - *Demonstration Bulletin: Low Temperature Thermal Aeration (LTTA) System, Canonis Environmental Services, Inc.*
  EPA/540/MR-93/504

- *Demonstration Bulletin: Roy F. Weston, Inc.: Low Temperature Thermal Treatment System*.
  EPA/540/MR-92/019



Cyclone Furnace

- *Demonstration Bulletin: SoilTech Anaerobic Thermal Processor: Outboard Marine Corporation Site*.
  EPA/540/MR-92/078

* - *Demonstration Bulletin: Thermal Desorption System, Clean Berkshires, Inc.*
  EPA/540/MR-94/507

* - *Demonstration Bulletin: X-TRAX Model 200 Thermal Desorption System, Chemical Waste Management Inc.*
  EPA/540/MR-93/502

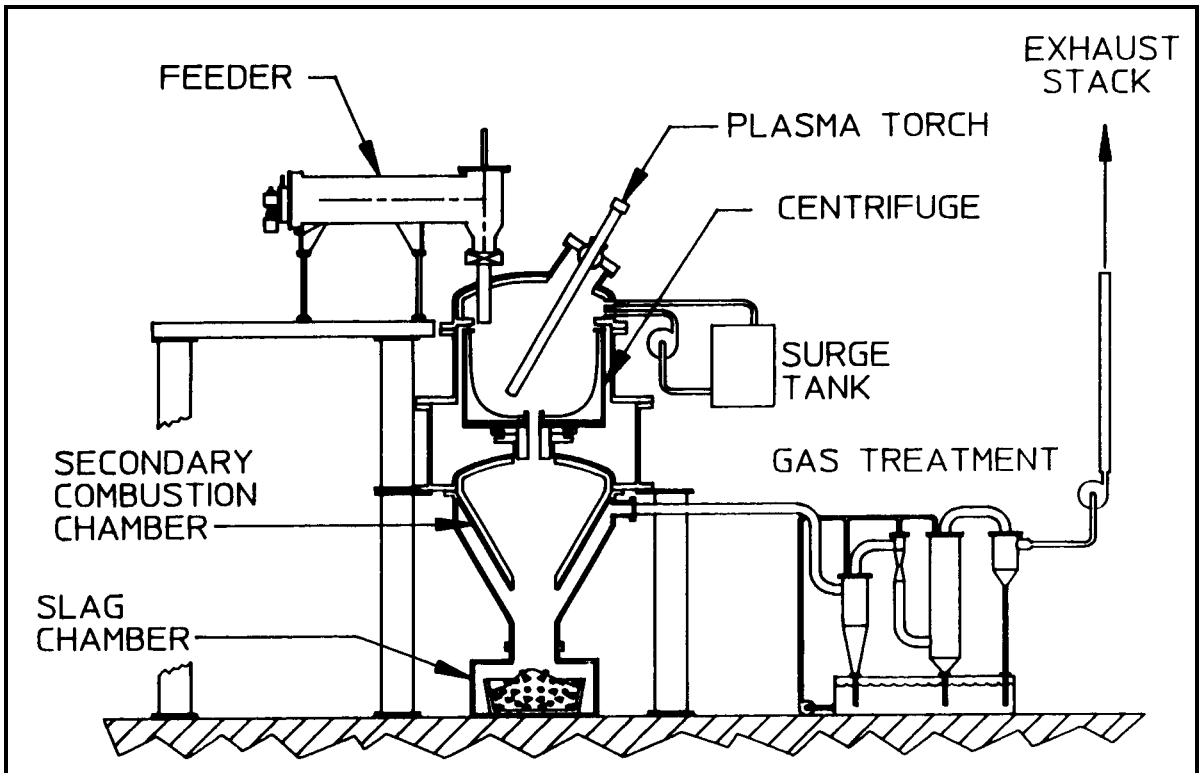
- *Engineering Bulletin: Mobile/Transportable Incineration Treatment*.
  EPA/540/2-90/014

- *Engineering Bulletin: Pyrolysis Treatment*.
  EPA/540/S-92/010

- *Engineering Bulletin: Thermal Desorption Treatment*.
  EPA/540/2-91/008

- *Handbook: Vitrification Technology for the Treatment of Hazardous and Radioactive Waste*.
  EPA/540/R-92/012

- *Innovative Technology: In Situ Vitrification*.
  OSWER Directive 9200.5-251-FS (Fact Sheet)



Plasma Centrifugal Furnace

- *Radio Frequency Enhanced Decontamination of Soils Contaminated with Halogenated Hydrocarbons*.
  EPA/600/S2-89/008

DOE

* - *Development of a Combined Soil Wash/In-Furnace Vitrification System for Soil Remediation at DOE Sites*. Office of Technology Development. 1992.
  NTIS: DOE/CH-9204

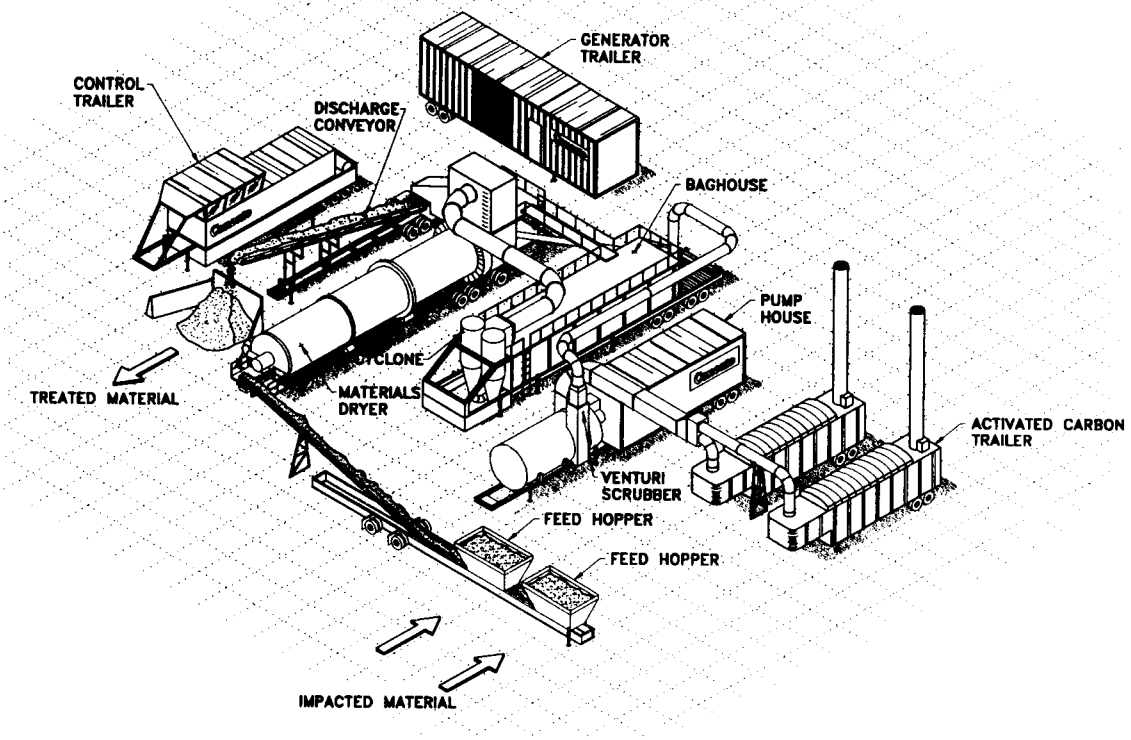
- *Evaluation of the Molten Salt Oxidation Process Technology.*
  DOE/ID/12584-97, GJPO-105

U.S. Army

- *Bench-Scale Investigation of Low Temperature Thermal Stripping of Volatile Organic Compounds (VOCs) from Various Soil Types: Technical Report*. Johnson, N.P., *et al*. U.S. Army Environmental Center. Nov. 1987.
  AMXTH-TE-CR-87124

- *Demonstration of Thermal Stripping of JP-4 and other VOCs from Soils at Tinker Air Force Base, Oklahoma City, OK: Final Report*. U.S. Army Environmental Center. Mar. 1990.
  CETHA-TS-CR-90026

- *Economic Evaluation of Low Temperature Thermal Stripping of Volatile Organic Compounds*



Low Temperature Thermal Aeration

from Soil: Technical Report. Marks and Noland. U.S. Army Environmental Center. Aug. 1986.
AMXTH-TE-CR-86085

- *Final Report: Design Support for a Hot Gas Decontamination System for Explosives-Contaminated Buildings*. Maumee Research and Engineering. U.S. Army Environmental Center.
  CETHA-TS-CR-91064

- *Final Technical Report: Pilot Test of Hot Gas Decontamination of Explosives-Contaminated Equipment at Hawthorne Army Ammunition Plant (HWAAP), Hawthorne, NV*. U.S. Army Environmental Center. July 1990.
  No published document number.

- *Pilot Investigation of Low Temperature Thermal Stripping of Volatile Organic Compounds from Soil (2 vols.)*. U.S. Army Environmental Center. Task 11. June 1986.
  AMXTH-TE-TR-86074

F. BIOLOGICAL

Biological treatment technologies are any treatment system that includes a biological component. Most fall under the heading bioremediation since they involve the active introduction of a biological agent (*e.g.*, microbe) in the cleanup. **Bioremediation** techniques are destruction techniques that seek to stimulate microorganisms to degrade organic contaminants by using them as a food and energy source. Most techniques seek to create an environment that will support agent growth. **Bioventing** injects air into contaminated soil to provide a continuous oxygen source, enhancing the growth of microorganisms naturally present in the soil (additives also may be required to stimulate microbial growth). **Composting** is a process by which organic materials are biodegraded by microorganisms, generating organic and inorganic by-products and energy in the form of heat, which is trapped within the compost matrix.

Although not all organic compounds are amenable to biodegradation, bioremediation techniques have been used to remediate soils, sludges, and groundwater contaminated by petroleum hydrocarbons, solvents, pesticides, wood preservatives, and other organic chemicals. Bioremediation is not applicable for the remediation of inorganic contaminants.

EPA

- *A Bioventing Approach To Remediate A Gasoline Contaminated Surface*.
  EPA/600/A-92/220; NTIS: PB93-119816

- *Action of a Fluoranthene-Utilizing Bacterial Community of Polycyclic Aromatic Hydrocarbon Components of Creosote*.
  EPA/600/J-89/425

- *Adaptation to and Biodegradation of Xenobiotic Compounds by Microbial Communities from a Pristine Aquifer*. Aelion, C.M., *et al*. Appl. Environ. Microbiol. 53(9): 2212-2217. Sept. 1987.
  EPA/600/J-87/208; NTIS: PB 88-170584

- *Aerobic Biodegradation of Natural and Xenobiotic Organic Compounds by Subsurface Microbial Communities*. Swindoll, C.M., *et al*. Environmental Toxicology and Chemistry. 7(4): 291-299. Apr. 1988.
  EPA/600/J-88/067; NTIS: PB 89-103204

- *Alaskan Oil Spill Bioremediation Project*.
  EPA/600/8-89/073

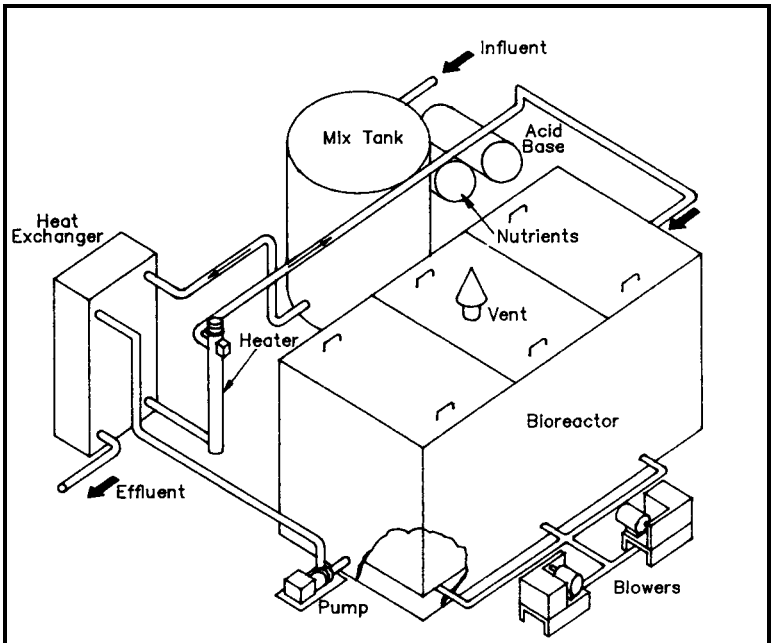
- *Anaerobic Biotransformations of Pollutant Chemicals in Aquifers*. Suflita, J.M., *et al*. Journal of Industrial Microbiology. 3(3): 179-194. May 1988.
  EPA/600/J-88/142; NTIS: PB 89-119341

- *Anaerobic Degradation of Nitrogen Substituted and Sulfonated Benzene Aquifer Contaminants*. Suflita, J.M. Hazardous Wastes and Hazardous Materials. 6(2): 121-133. Spring 1989.
  EPA/600/J-89/190; NTIS: PB 90-140708

- *Anaerobic Degradation of o-, m- and p-Cresol by Sulfate-Reducing Bacterial Enrichment Cultures Obtained from a Shallow Anoxic Aquifer*. Suflita, J.M., *et al*. Journal of Industrial Microbiology. 4(4): 255-266. Jul. 1989.
  EPA/600/J-89/187; NTIS: PB 90-140674

- *Applications Analysis Report — Biotrol: Biotreatment of Groundwater*.
  EPA/540/A5-91/001

- *Approach to Bioremediation of Contaminated Soil*.
  EPA/600/J-90/203



BioTrol Aqueous Treatment System (BATS)

- *Assessing Detoxification and Degradation of Wood Preserving and Petroleum Wastes in Contaminated Soil*.
  EPA/600/J-90/099

- *Athias — An Information System for Abiotic Transformations of Halogenated Hydrocarbons in Aqueous Solution*. Ellenrider and Reihhard. Chemosphere. 17(2): 331-344. Feb. 1988.
  EPA/600/J-88/026; NTIS: PB 88-224357

- *Biological Remediation of Contaminated Sediments, with Special Emphasis on the Great Lakes*.
  EPA/600/S9-91/001

- *Biological Treatment of Leachate from a Superfund Site*.
  EPA/600/J-89/001

- *The Biodegradation of Cresol Isomers in Anoxic Aquifers*. Smolenski and Suflita. Appl. Environ. Microbiol. 53(4): 710-716. Apr. 1987.
  EPA/600/J-87/131; NTIS: PB 88-149125

- *Bioremediation Case Studies: Abstracts*.
  EPA/600/9-92/044; NTIS: PB92-232347

- *Bioremediation Case Studies: An Analysis of Vendor Supplied Data*.
  EPA/600/R-92/043; NTIS: PB92-232339

- *Bioremediation Field Initiative Fact Sheets*.
  EPA/540/F-92/012

- *Bioremediation of Contaminated Surface Soils*. Sims, J.L., *et al*. Robert S. Kerr Environmental Research Laboratory, U.S. EPA, Ada, OK. Aug. 1989.
  EPA-600/9-89/073; NTIS: PB 90-164047/XAB

- *Bioremediation of Hazardous Waste*.
  EPA/600/9-90/041

- *Bioremediated Soil Venting of Light Hydrocarbons*.
  EPA/600/J-90/397; NTIS: PB91-171538/XAB

- *Biorestoration of Aquifers Contaminated with Organic Compounds*. Lee, M.D., *et al*. CRC Critical Reviews in Environmental Control. 18(1): 29-89. 1988.
  EPA/600/J-88/078; NTIS: PB 89-103527

- *Biotransformation of Priority Pollutants Using Biofilms and Vascular Plants*. Wolvedon and McCales. Mississippi Academy of Sciences. Vol. XXXI. pp. 79-89. 1986.
  EPA/600/J-86/310; NTIS: PB 87-176764

- *Biotransformation of Selected Alkylbenzenes and Halogenated Aliphatic Hydrocarbons in Methanogenic Aquifer Material: A Microcosm Study*. Smith, B.H., *et al*. Environ. Sci. Technol. 20(10): 997-1002. 1986.
  EPA/600/J-86/227; NTIS: PB 87-170791

- *Demonstration Bulletin: Aqueous Biological Treatment System (Fixed Film Biodegradation)*.

EPA/540/M5-91/001

* ● *Demonstration Bulletin: Augmented In Situ Subsurface Bioremediation Process, Bio-Rem, Inc.*
EPA/540/MR-93/527

● *Demonstration Bulletin: International Technology Corporation: Slurry Biodegradation*.
EPA/540/M5-91/009

* ● *Demonstration Bulletin: Ex Situ Anaerobic Bioremediation System, Dinoseb, J.R. Simplot Company*
EPA/540/MR-94/508

● *Determination and Enhancement of Anaerobic Dehalogenation: Degradation of Chlorinated Organics in Aqueous Systems*.
EPA/600/2-88/054

● *Determination of Optimal Toxicant Loading for Biological Closure of a Hazardous Waste Site*.
EPA/600/D-89/163

● *Engineering Bulletin: Slurry Biodegradation*.
EPA/540/2-90/016; NTIS: PB91-228049

● *Enhanced Bioremediation Utilizing Hydrogen Peroxide as a Supplemental Source of Oxygen*. Huling and Bledsoe.
EPA/600/2-90/006; NTIS: PB90-183435

● *Extrapolation of Biodegradation Results to Groundwater Aquifers: Reductive Dehalogenation of Aromatic Compounds*. Gibson and Suflita. Appl. Environ. Microbiol. 52(4): 681-688. Oct. 1986.
EPA/600/J-86/379; NTIS: PB87-212429/AS

● *Field Evaluation of Bioremediation of a Fuel Spill Using Hydrogen Peroxide*.
NTIS: PB88-130257

● *Field Evaluation of In Situ Biodegradation for Aquifer Restoration*. Semprini, L., P. Roberts, G. Hopkins, D. Mackay. Stanford University, Stanford, CA. Nov. 1987.
EPA/600/2-87/096; NTIS: PB88-130257

● *Innovative Technology: Slurry-Phase Biodegradation*.
OSWER Directive 9200.5-252-FS (Fact Sheet)

● *In Situ Aquifer Restoration of Chlorinated Aliphatics by Methanotrophic Bacteria*. Roberts, P., *et al*. Jul. 1989.
EPA/600/2-89/033; NTIS: PB 89-21992/AS

* ● *In Situ Bioremediation of Contaminated Unsaturated Subsurface Soils*.
EPA/540/S-93/501; NTIS: PB93-234565

- *In Situ Bioremediation of Ground Water*.
  EPA/540/S-92/003; NTIS: PB92-224336

* - *In Situ Bioremediation of Ground Water and Geological Material: A Review of Technologies*
  EPA/600/SR-93/124; NTIS: PB93-215564

- *In Situ Bioremediation of Spills from Underground Storage Tanks: New Approaches for Site Characterization, Project Design, and Evaluation of Performance*. Wilson and Leach.
  EPA/600/2-89/042; NTIS: PB 89-219976 (Available from EPA, Ada, OK)

- *In Situ Biorestoration as a Ground Water Remediation Technique*. Wilson, J.T., *et al*. Ground Water Monitoring Review. pp. 56-64. Fall 1986.
  EPA/600/J-86/305; NTIS: PB 87-177101

- *In-Situ Biotransformation of Carbon Tetrachloride under Anoxic Conditions*.
  EPA/600/S2-90/060

- *Interactive Simulation of the Fate of Hazardous Chemicals During Land Treatment of Oily Wastes: Ritz User's Guide*.
  NTIS: PB-88-195540

- *Laboratory Studies Evaluating the Enhanced Biodegradation of Weathered Crude Oil Components Through the Application of Nutrients*.
  EPA/600/D-90/139

- *Leaking Underground Storage Tanks: Remediation with Emphasis on In Situ Biorestoration*. Thomas, J.M., *et al*. Jan. 1987.
  EPA/600/2-87/008; NTIS: PB 87-168084

- *Lubbock Land Treatment System Research and Demonstration Project — Volume 2: Percolate Investigation in the Root Zone*.
  EPA/600/2-86/027b

- *Lubbock Land Treatment System Research and Demonstration Project — Volume 5: Executive Summary*.
  EPA/600/2-86/027e

- *Microbial Decomposition of Chlorinated Aromatic Compounds*.
  EPA/600/2-86/090

- *Microbial Degradation of Nitrogen, Oxygen and Sulfur Heterocyclic Compounds Under Anaerobic Conditions: Studies with Aquifer Samples*. Kuhn and Suflita. Environmental Toxicology and Chemistry. 8(12): 1149-1158. Dec. 1989.
  EPA/600/J-89/353; NTIS: PB 90-216276

- *Microbial Removal of Halogenated Methanes, Ethanes, and Ethylenes in an Aerobic Soil Exposed to Methane*. Henson, J.M., *et al*. FEMS Microbiology Ecology. 53(3-4): 193-201. May-Jun. 1988.
  EPA/600/J-88/066; NTIS: PB 90-103196

- *Mobility and Degradation of Residues at Hazardous Waste Land Treatment Sites at Closure*.

EPA/600/2-90/018; NTIS: PB90-212564/A5

- *Nitrate for Biorestoration of an Aquifer Contaminated with Jet Fuel*.
  EPA/600/S2-91/009

- *Opportunities for Bioreclamation of Aquifers Contaminated with Petroleum Hydrocarbons*. Wilson and Ward. Developments in Industrial Microbiology (Journal of Industrial Microbiology Suppl. I). Elsevier, Amsterdam, Biomedical Division. 27: 109-116. 1987.
  EPA/600/J-87/133; NTIS: PB 88-148150

- *Promising Technologies for the Biological Detoxification of Hazardous Waste*.
  EPA/600/D-88/040

- *Reductive Dehalogenation of a Nitrogen Heterocyclic Herbicide in Anoxic Aquifer Slurries*. Adrian and Suflita. Appl. Environ. Microbiol. 56(1): 292-294. Jan. 1990.
  EPA/600/J-90/098; NTIS: PB 90-245267

- *Removal of Volatile Aliphatic Hydrocarbons in a Soil Bioreactor*.
  NTIS: PB88-170568

- *Removal of Volatile Aliphatic Hydrocarbons in a Soil Bioreactor*. Kampbell, D., *et al*. Journal of Air Pollution Control and Hazardous Waste Management. 37(10): 1236-1240. Oct. 1987.
  EPA/600/J-87/261; NTIS: PB 88-180393

- *Role of Microorganisms in the Bioremediation of the Oil Spill in Prince William Sound, Alaska*.
  EPA/600/D-90/119

- *Sequential Reductive Dehalogenation of Chloroanilines by Microorganisms from a Methanogenic Aquifer*. Kuhn and Suflita. Environmental Science Technology. 23(7): 848-852. Jul. 1989.
  EPA/600/J-89/103; NTIS: PB90-117219/AS

- *Structural Properties of Organic Chemicals as Predictors of Biodegradation and Microbial Toxicity in Soil*. Walton and Anderson. Chemosphere.17(8): 1501-1507. Aug. 1989.
  EPA/600/J-88/413; NTIS: PB90-117078/AS

- *Transformation of Halogenated Aliphatic Compounds*.
  NTIS: PB88-249859

- *Transport of Dissolved Hydrocarbons Influenced by Oxygen-Limited Biodegradation. I. Theoretical Development*. Borden and Bedient. Water Resources Research. 22(13): 1973-1982. Dec. 1986.
  EPA/600/J-86/333; NTIS: PB 87-179727

- *Transport of Dissolved Hydrocarbons Influenced by Oxygen-Limited Biodegradation. II. Field Application*. Borden, R.C., *et al*. Water Resources Research. 22(13): 1983-1990. Dec. 1986.
  EPA/600/J-86/333; NTIS: PB 87-179735

DOE

* - *Bench-Scale Demonstration of a Bioreactor System to Treat Chlorinated Volatile Contaminants*

in Groundwater. Office of Technology Development. 1992.
NTIS: DOE/CH-9207

- *Biodenitrification of Hanford Groundwater and Process Effluents: FY 1988 Status Report*. Koegler, S.S., *et al*. Pacific Northwest Laboratory, DOE, Richland, WA. Sept. 1989.
PNL-6917; NTIS or OSTI: DE90000993

- *Bioremediation of PCB-Contaminated Soil at the T-12 Plant*. Donaldson, T.L., *et al*. Oak Ridge National Laboratory, DOE, TN. Sept. 1988.
ORNL/TM-10750; NTIS or OSTI: DE89001335

* - *Composting of Soils/Sediments and Sludges Containing Toxic Organics Including High Energy Explosives*. Office of Technology Development. 1992.
NTIS: DOE/CH-9208

- *Development of a Biological Process for Destruction of Nitrates and Carbon Tetrachloride in Hanford Groundwater*. Koegler, S.S., *et al*. Pacific Northwest Laboratory, DOE, Richland, WA. Oct. 1989.
PNL-SA-16928; NTIS or OSTI: DE90004675

- *Development of a Biological Treatment System for Hanford Groundwater Remediation: FY 1989 Status Report*. Brouns, T.M., *et al*. Pacific Northwest Laboratory, DOE, Richland, WA. Apr. 1990.
PNL-7290; NTIS or OSTI: DE90010365

* - *Remediation of Groundwater Containing Radionuclides, Heavy Metals, Inorganic Ions, and/or Organics Using the AlgaSORB Biosorbent System*. Office of Technology Development. 1992.
NTIS: DOE/CH-9212

- *Test Plan for In Situ Bioremediation Demonstration of the Savannah River Integrated Demonstration Project DOE/OTD TTP No.: SR0566-01 (U)*.
WSRC-RD-91-23

DOI

- *A Biohydrometallurgical Technique for Selenium Removal from Wastewater*. Larsen, D.M., *et al*. Proceedings of the American Water Resources Association 23rd Annual Conference and Symposium, Salt Lake City, Utah, 1987.
AWRA Technical Publication TPS-87-4

- *Advances in Biological Cyanide Detoxification*. Altringer, P.B., *et al*. *Proceedings from the Randol Gold forum, Vancouver '92*.
No published document number.

- *Arsenic Removal from Mining Wastewaters Using Sulfate-Reducing Bacteria in a Two-Stage Bioreactor*. Belin, D.D., *et al*. International Biohydrometallurgy Symposium, August 1993.
  No published document number.

- *Bacterial Destruction of Cyanide*. Altringer and Lien. A Report from the Conference on "Successful Mine Reclamation: What Works."
  No published document number.

- *Bacterial Leaching of Metals from Various Matrices Found in Sediments, Removing Inorganics from Sediment-Associated Waters Using Bioaccumulation and/or BIO-FIX Beads*. Altringer, P.B. Presented at EPA-ARCS Workshop, Manitowoc, Wisconsin, 1990.
  No published document number. See Biological Remediation of Contaminated Sediments with Special Emphasis on the Great Lakes (EPA/600/9-91/001)

- *BIO-FIX Water Treatment Technology*. Jeffers, T.H., *et al*. Published in the Randol Gold Forum Cairns '91 Proceedings. April 1991.
  No published document number.

- *Biological Arsenic Removal from Mining and Mill Waters by Anaerobic Sulfate Reducing Bacteria*. Dinsdale, B.E., *et al*. Proceedings of the 2nd International Conference on Environmental Issues and Management of Waste in Energy and Mineral Production, Calgary, Alberta, Canada, September 2-4, 1992.
  No published document number.

- *Biological and Chemical Cyanide Destruction from Heap Leachates and Residues*. Lien, R.H., *et al*. Environmental Management for the 1990's. 1991.
  No published document number.

- *Biological and Chemical Cyanide Destruction from Precious Metals Solutions*. Lien, R.H., *et al*. Presented at AIME-SME GOLDTech 4, Reno, NV. Sept. 1990.
  No published document number.

- *Biological and Chemical Selenium Removal from Precious Metals Solutions*. Altringer, P.B., *et al*. Environmental Management for the 1990's. 1991.
  No published document number.

- *Biological Treatment of Acid Mine Waters — Case Studies*. Bennett, P.G., *et al*. Published in Proceedings, Second International Conference on the Abatement of Acidic Drainage. Sept. 1991.
  No published document number.

- *Biologically Assisted Control of Selenium in Process Waste Waters*. Larsen, D.M., *et al*. Presented at the 118th Annual AIME Meeting, February 1989.
  No published document number.

- *Bioreduction of Selenate and Selenite and Potential Industrial Applications*. D.J. Adams, *et al*. Presented at the Engineering Foundation Innovative Separation Technologies Meeting, Palm Coast, Florida, March 1993.
  No published document number.

- *Bioremediation for Removal of Inorganics from Contaminated Sediment*. Adams and Altringer. Presented at the Assessment and Treatment of Contaminated Sediments in the North Branch of

the Chicago River Conference, October 19-20, 1992.
No published document number.

- *Biosorption of Metal Contaminants from Acidic Mine Waters*. Jeffers, T.H., *et al*. Published by the Minerals, Metals and Materials Society. 1991.
No published document number.

- *Biosorption of Metal Contaminants from Acidic Mine Waters*. Corwin and Jeffers. Published in Conference Proceedings: Association of Abandoned Mine Land Programs, 13th Annual Conference by Missouri Department of Natural Resources. Oct. 1991.
No published document number.

- *Biosorption of Metal Contaminants Using Immobilized Biomass*. Jeffers, T.H., *et al*. Published in Biohydrometallurgy — Proceedings of the International Symposium, Jackson Hole, WY, August 13-18, 1989.
No published document number.

- *Biosorption of Metal Contaminants Using Immobilized Biomass — A Laboratory Study*. Jeffers, T.H., *et al*. 1990.
No published document number.

- *Case Study: Bacterial Cyanide Detoxification During Closure of the Green Springs Gold Heap Leach Operation*. Lien and Altringer. Presented at the International Biohydrometallurgy Symposium, August 1993.
No published document number.

- *Chemical and Biological Cyanide Destruction and Selenium Removal from Precious Metals Tailings Pond Water*. Lien, R.H, *et al*. Published in Gold 90. Society of Mining, Metallurgy, and Exploration. 1990.
No published document number.

- *Determining Mechanisms of Anoxic Bacterial Selenium Removal*. Altringer, P.B., *et al*. Published in Selenium in the Environment. Marcel Dekker, Inc. 1993.
No published document number.

- *Mathematically Modeling the Removal of Heavy Metals from a Wastewater Using Immobilized Biomass*. Trujillo, E.M., *et al*. Environmental Science and Technology. 25:9:1,559-1,568. 1991.

- *Removal of Metal Contaminants from a Waste Stream Using BIO-FIX Beads Containing Sphagnum Moss*. Bennett and Jeffers. Presented at the Western Regional Symposium on Mining and Mineral Processing Wastes. 1990.
No published document number.

- *Removal of Metal Contaminants from Waste Waters Using Biomass Immobilized in Polysulfone Beads*. Ferguson and Peterson. Presented at the 1989 AIME Annual Meeting. 1989. Published in Biotechnology in Minerals and Metals Processing. 1989.
No published document number.

U.S. Air Force

- *Aerobic Degradation of Trichlorethylene*. Nelson, M.J.K., *et al*. Jul. 1987.

ESL-TR-86-44; NTIS: AD-A184 948/8/XAB

- *Assessment of In-Situ Bioremediation Potential and the Application of Bioventing at a Fuel Contaminated Site*. Dupont, R.R., *et al*. Published in Bioreclamation. pp. 262-282. 1991.

- *Batch and Column Studies on BTEX Biodegradation by Aquifer Microorganisms Under Denitrifying Conditions*. Hutchins, S.R., *et al*. March 1993.

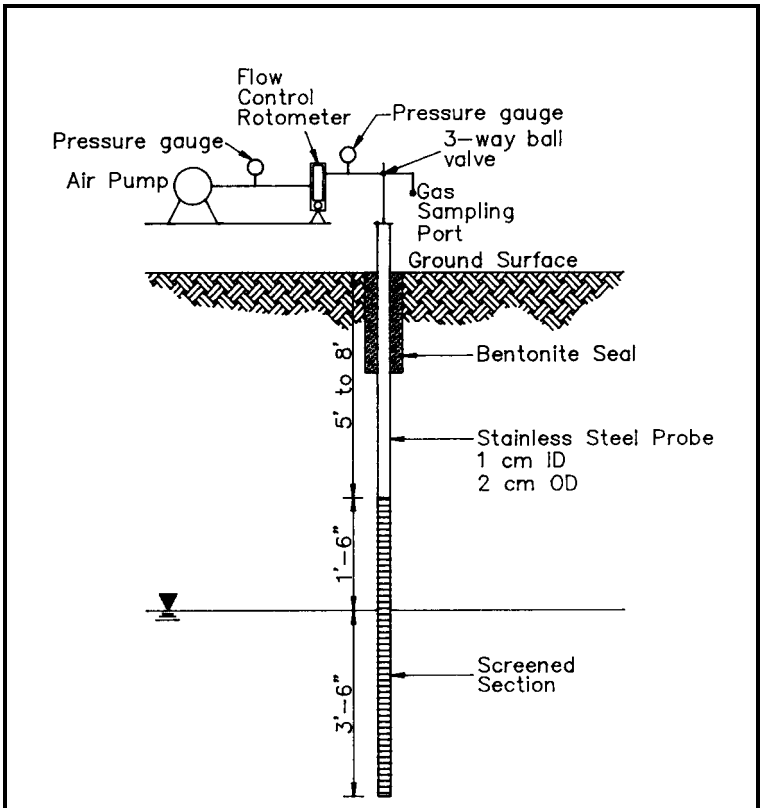
ESL-TR-92-16

- *Bench Scale Studies of the Soil Aeration Process for Bioremediation of Petroleum Hydrocarbon Soil*. Hinchee and Arthur. Journal of Applied Biochemistry and Biotechnology. 28/29:287-289. 1991

- *Biodegradation and Sorption of Organic Solvents and Hydrocarbon Fuel Constituents in Subsurface Environments*. Wilson, J.T., *et al*. Engineering and Services Laboratory, Air Force Engineering and Services Center, Tyndall Air Force Base, FL. Mar. 1988.

ESL-TR-87-52; NTIS: AD-A203 753/9/XAB

- *Biodegradation of Dichloromethane and Its Utilization as a Growth Substrate Under Methanogenic Conditions*. Freedman and Gossett. Applied and Environmental Microbiology. 57:2847-2857. 1991.



Bioventing System

- *Biodegradation of Dichloromethane in a Fixed Film Reactor Under Methanogenic Conditions*. Freedman and Gossett. Proceedings — In-Situ and On-Site Bioreclamation: An International Symposium. San Diego, CA. 1991.
  No published document number.

- *Biodegradation of Mixed Solvents by a Strain of Pseudomonas*. Spain, J.C., *et al*. Published in Environmental Biotechnology for Waste Treatment. Plenum Press. New York, NY. 1991.

- *Biodegradation of Monoaromatic Hydrocarbons by Aquifer Microoganisms Using Oxygen, Nitrate, or Nitrous Oxide as the Terminal Electron Acceptor*. Hutchins, S.R. Applied and Environmental Microbiology. 57:2403-2407. 1991.

- *Biological Reductive Dechlorination of Tetrachloroethylene and Trichloroethylene to Ethylene Under Methanogenic Conditions*. Freedman and Gossett. Applied and Environmental Microbiology. 55:2144-2151. 1989.

- *Biotransformation and Mineralization of Benzene, Toluene, and Xylenes Under Denitrifying and Microaerophilic Conditions*. Hutchins, S.R. Extended Abstract, 3rd International Conference on Groundwater Quality Research. Dallas, TX. In Press. 1992.
  No published document number.

- *Chlorobenzene Degradation by Bacteria Isolated from Contaminated Groundwater*. Nishino, S.F., *et al*. Applied and Environmental Microbiology. 58:1719-1726. 1992.

- *Column Studies on BTEX Biodegradation Under Microaerophilic and Denitrifying Conditions*. Hutchins, S.R., *et al*. Proceedings — 4th Annual Symposium of the Gulf Coast Hazardous Substance Research Center. Lamar University, Beaumont, TX. pp. 67-90. 1992.
  No published document number.

- *Column Studies on BTEX Biodegradation Under Microaerophilic and Denitrifying Conditions*. Hutchins, S.R., *et al*. Extended Abstract, 3rd International Conference on Groundwater Quality Research. Dallas, TX. In Press. 1992.
  No published document number.

- *Combined Biological and Physical Treatment of a Jet Fuel-Contaminated Aquifer*. Downey, D.C., *et al*. Proceedings — NWWA/API Conference on Petroleum Hydrocarbons and Organic Chemicals in Groundwater. Houston, TX. 1988.
  No published document number.

- *Combined Biological and Physical Treatment of a Jet Fuel-Contaminated Aquifer*. Downey, D.C., *et al*. U.S. Air Force Engineering and Services Center, Tyndall, Air Force Base, FL. 1989.
  No published document number.

- *Enhanced Bioreclamation of Jet Fuels — A Full-Scale Test at Eglin Air Force Base, FL*. Hinchee, R.E., *et al*. Air Force Engineering and Services Laboratory Technical Report. 1989.
  ESL-TR-88-78; NTIS: AD-A22 348/5/XAB

- *Enhanced Bioreclamation, Soil Venting, and Groundwater Extraction: A Cost-Effectiveness and Feasibility Comparison*. Hinchee, R.E., *et al*. Proceedings of the Conference on Petroleum Hydrocarbons and Organic Chemicals in Groundwater: Prevention, Detection, and Restoration. 1988.
  No published document number.

- *Enhanced In Situ Biodegradation: Uncontrolled Decomposition of Hydrogen Peroxide by Bacteria*. Spain, J.C., *et al*. Groundwater. 27:163-167. 1989.

- *Enhancing Biodegradation of Petroleum Hydrocarbon Fuels in the Vadose Zone through Soil Venting*. Hinchee, R.E., *et al*. Proceedings — API/NWWA Conference: Petroleum Hydrocarbons in the Subsurface Environment. pp. 235-248. 1989.
  No published document number.

- *Enhancing Biodegradation of Petroleum Hydrocarbons through Soil Venting*. Hinchee, R.E., *et al*. Journal of Hazardous Materials. 27:315-325. 1991.

- *A Field-Scale Investigation of Petroleum Hydrocarbon Degradation in the Vadose Zone Enhanced by Soil Venting at Tyndall AFB, FL*. Miller, R.N, *et al*. Published in In-Situ Bioreclamation (Hinchee and Olfenbuttel, Editors). pp. 283-302. 1991.
  No published document number.

- *Formulation of Nutrient Solutions for In-Situ Bioremediation*. Aggarwal, P.K., *et al*. Published in In-Situ Bioreclamation (Hinchee and Olfenbuttel, Editors). pp. 51-66. 1991
  No published document number.

- *In Situ Biological Degradation Test at Kelly Air Force Base, TX. Vol. 1: Site Characterization, Lab Studies, and Treatment System Design and Installation*. Wetzel, *et al*. Air Force Engineering and Services Center. Apr. 1986.
  ESL-TR-85-52; NTIS: AD-A169 993/3/XAB

- *In Situ Biological Degradation Test at Kelly Air Force Base, TX. Vol. 2: Field Test Results and Cost Model. Final Report*. Wetzel, *et al*. Air Force Engineering and Services Center. Jul. 1987.
  ESL-TR-85-52 Vol 2; NTIS: AD-A187 486/6/XAB

- *In Situ Biological Degradation Test at Kelly Air Force Base, TX. Vol. 3: Appendices. Final Report.* Wetzel, *et al*. Air Force Engineering and Services Center. Jul. 1987.
  ESL-TR-85-52 Vol 3; NTIS: AD-A186 279/6/XAB

- *In-Situ Respirometry for Determining Aerobic Degradation Rates*. Ong, S.K., *et al*. Published in In-Situ Bioreclamation (Hinchee and Olfenbuttel, Editors). pp. 541-545. 1991.
  No published document number.

- *Methods to Select Chemicals for In Situ Biodegradation of Fuel Hydrocarbons*. Aggarwal, P.K., *et al*. Jul. 1990.
  ESL-TR-90-13

- *Monitoring In-Situ Biodegradation of Hydrocarbons Using Stable Carbon Isotopes*. Aggarwal and Hinchee. Environmental Science and Technology. 26(6):1178-1180. 1991.

- *Optimizing Bioventing in Shallow Vadose Zones and Cold Climates*. Leeson, A., *et al*.

Proceedings — In-Situ Bioremediation Symposium. Ontario, Canada. 1992.
No published document number.

- *Performance of Selected In-Situ Soil Decontamination Technologies: An Air Force Perspective*. Downey and Elliott. Environmental Progress. 9:169-173. 1990.

- *Preliminary Development of a Bench-Scale Treatment System for Aerobic Degradation of Trichloroethylene*. Nelson, M.J.K., *et al*. Proceedings — Reducing Risks from Environmental Chemicals through Biotechnology Conference. University of Washington. 1987.
  No published document number.

- *A Rapid Rise In-Situ Respiration Test for Measuring Aerobic Biodegradation Rates of Hydrocarbons in Soils*. Hinchee and Ong. Journal of the American Waste Management Association. 42:1305-1312. 1992.

- *Surface Based Biological Treatment of TCE Contaminated Groundwater*. Battelle Columbus Final Report to the U.S. Air Force.
  ESL-TR-90-03

- *The Role of Hydrogen Peroxide Stability in Enhanced Bioreclamation Effectiveness*. Hinchee, R.E., *et al*. Proceedings — NWWA/API Conference on Petroleum Hydrocarbons and Organic Chemicals in Groundwater. Houston, TX. 1988.
  No published document number.

- *Use of Hydrogen Peroxide as an Oxygen Source for In-Situ Biodegradation: Part I, Field Studies*. Hinchee, R.E., *et al*. Journal of Hazardous Materials. 27:315-325. 1991.

- *Use of Hydrogen Peroxide as an Oxygen Source for In-Situ Biodegradation: Part II, Laboratory Studies*. Aggarwal, P.K., *et al*. Journal of Hazardous Materials. 27:301-314. 1991.

- *Use of Methanotrophs in an Above-Ground Reactor To Treat Groundwater Contaminated with Trichloroethylene*. Allen, B.R., *et al*. Proceedings of the Conference on Petroleum Hydrocarbons and Organic Chemicals in Groundwater: Prevention, Detection, and Restoration. 1988.
  No published document number.

U.S. Army

- *Biogrowth Control Mechanisms*. U.S. Army Environmental Center. June 1986.
  CETHA-TS-CR-91070

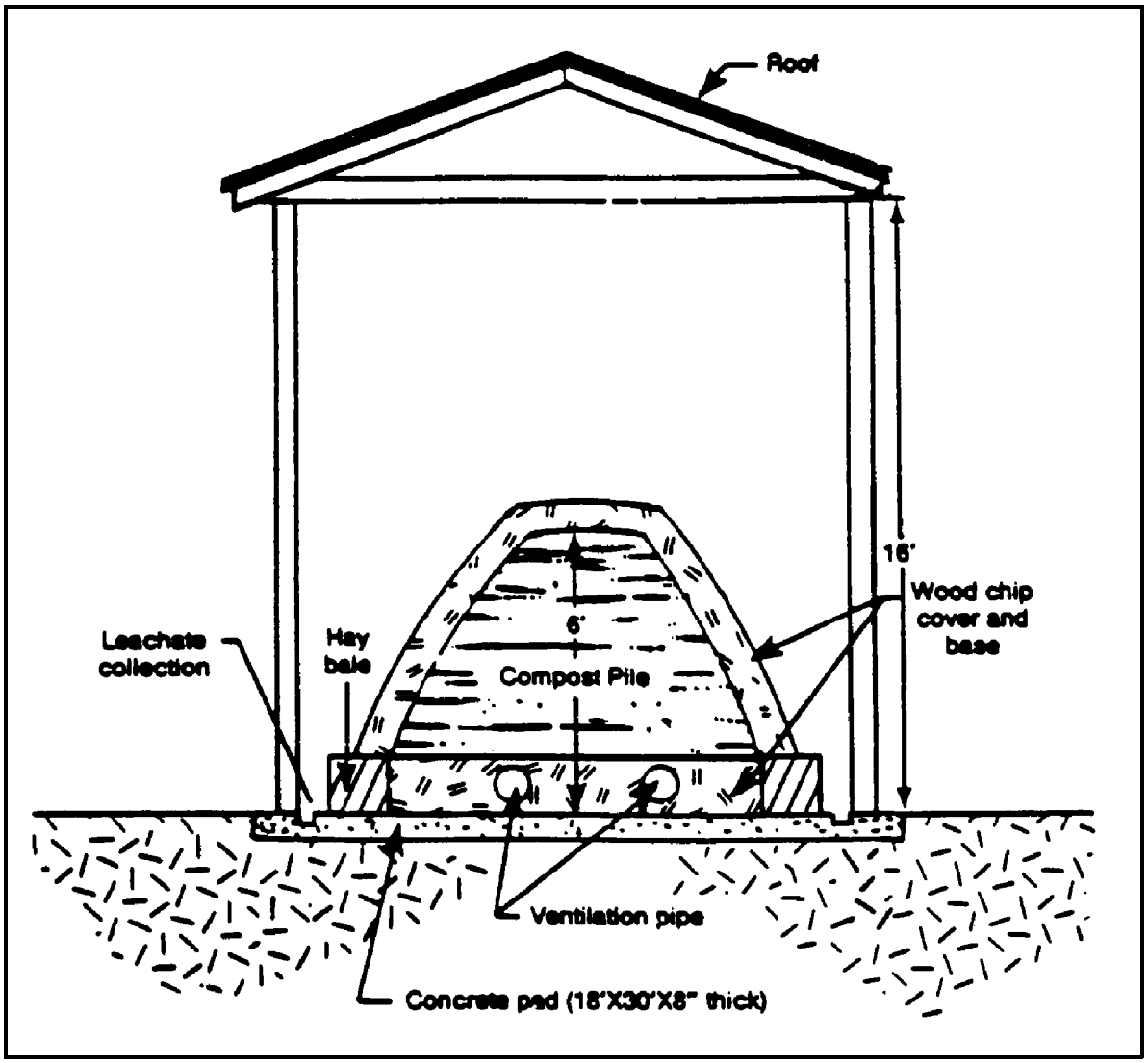
- *Biotreatment of Gaseous-Phase Volatile Organic Compounds*. U.S. Army Environmental Center. Jan. 1991.
  CETHA-TE-CR-89061

- *Composting Explosives/Organics Contaminated Soils*. Doyle, R.C., *et al*. U.S. Army Environmental Center. May 1986.
  AMXTH-TE-CR-86077

- *Composting of Explosive-Contaminated Soil Technology*. U.S. Army Environmental Center. Oct. 1989.
  CETHA-TE-CR-90027

* ● *Development of a Zero Headspace Aerobic, Suspended Growth Bioreactor*. Zappi, M., *et al*. U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS. 1994.
Report No. MP-EL-94-8

* ● *Evaluation of Operational Factors Contributing to Reduced Recharge Capacity of the North Boundary Treatment System, Rocky Mountain Arsenal, Commerce City, CO*. Teeter, C., *et al*. U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS. 1994.
WES: EL-94-12



Aerated Static Pile Composting of Explosives

- *Field Demonstration — Composting of Propellants Contaminated Sediments at the Badger Army Ammunition Plant (BAAP)*. U.S. Army Environmental Center. Mar. 1989.
  CETHA-TE-CR-89061

- *Field Demonstration — Composting of Explosives-Contaminated Sediments at the Louisiana Army Ammunition Plant (LAAP)*. Williams, R.T., *et al*. U.S. Army Environmental Center. Sept. 1988.
  AMXTH-IR-TE-88242

- *Final Technical Report: Evaluation of Composting Implementation*. U.S. Army Environmental Center. Aug. 1989.
  No published document number.

- *Final Technical Report: Proceedings for the Workshop on Composting of Explosives Contaminated Soils*. U.S. Army Environmental Center. Sept. 1989.
  CETHA-TS-SR-89276

- *Literature Review of Biodegradation in Soil of Selected Rocky Mountain Arsenal Contamination: Isodrin, Dieldrin, Diisopropylmethylphosphate, 1, 2-Dibromo-3-Chloro-propane, and p-Chloro-Phenylmethylsulfoxide*. U.S. Army Environmental Center. Apr. 1987.
  CETHA-TS-CR-91065

- *Process and Economic Feasibility of Using Composting Technology to Treat Waste Nitrocellulose Fines*. U.S. Army Environmental Center. March 1991.
  CETHA-TE-CR-91012

* - *Rapid Development of Microbial Stains for Bioremediation of Military Soils and Dredged Materials Contaminated with Polycyclic Aromatic Hydrocarbons*. Gunnison, D., *et al*. U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS. 1993.
  WES: EL-93-18

- *Reclamation of Metals from Water with a Silage-Microbe Ecosystem*. U.S. Army Environmental Center. March 1991.
  CETHA-TE-CR-91037

- *Task Order 11: Biodegradation of DIMP, Dieldrin, Isodrin, DBCP, and PCPMSO in Rocky Mountain Arsenal Soils*. U.S. Army Environmental Center. Jan. 1989.
  CETHA-TE-CR-89006

U.S. Navy

- *Biodecontamination of Fuel Oil Spill Located at NAVCOMMSTA, Thurso, Scotland: Final Report.* Polybac Corporation, U.S. Naval Station, Point Mugu, CA. Dec. 1985.
  No published document number.

- *Biodegradation for On-Site Remediation of Contaminated Soils and Groundwater at Navy Sites*. Hoeppel, R.E. Naval Civil Engineering Laboratory. 1989.
  No published document number.

- *Bioreclamation Studies of Subsurface Hydrocarbon Contamination, NAS Patuxent River, MD*. Groundwater Technology, Inc. Dec. 1988.

No published document number.

- *Bioventing Soils Contaminated with Petroleum Hydrocarbons*. Hoeppel, R.E., *et al*. Naval Civil Engineering Laboratory. Journal of Industrial Microbiology. 8:141-146. May 1991.

- *Combined In Situ Technologies for Reclamation of Jet Fuel Contamination at a Maryland Fuel Farm*. Hoeppel, R.E. Oct. 1989.
  No published document number.

- *Design/Construction/Installation of Large Soil Columns, And Development/Testing of Innovative Soil Aeration Methods to Stimulate In Situ Biodegradation*. Arthur, M.F., *et al*. Battelle Laboratories, Columbus, OH. Jul. 1988.
  No published document number.

- *Evaluation of Innovative Approaches to Stimulate Degradation of Jet Fuels in Subsoils and Groundwater*. Arthur, M.F., *et al*. Battelle Laboratories, Columbus, OH. Aug. 1989.
  No published document number.

- *In Situ Bioreclamation — Applications and Investigations for Hydrocarbon and Contaminated Site Remediation*. (Hinchee and Olfenbuttel, Editors). Naval Civil Engineering Laboratory. Butterworth-Heinemann, Boston, MA. 1991.
  No published document number.

- *In Situ Generation of Oxygen by Electrolysis and the Electrochemical Effects on Micro-organisms' Population*. Han, M.K., *et al*. Battelle Laboratories, Columbus, OH. Nov. 1991.
  No published document number.

- *Literature Survey on Landfarming for Bioreclamation of Fuel-Contaminated Soil at Twenty Nine Palms, California*. Taback and Khan. AeroVironment Inc., Monrovia, CA. Dec. 1987.
  No published document number.

- *Removal of Aqueous Phase Petroleum Products in Groundwater by Aeration*. Wickramanayake, G.B., *et al*. Battelle Laboratories, Columbus, OH. Dec. 1988.
  No published document number.

- *Technology Review: In Situ/On-Site Biodegradation of Refined Oils and Fuel*. Riser, E. 1988.
  No published document number.

G. PHYSICAL/CHEMICAL

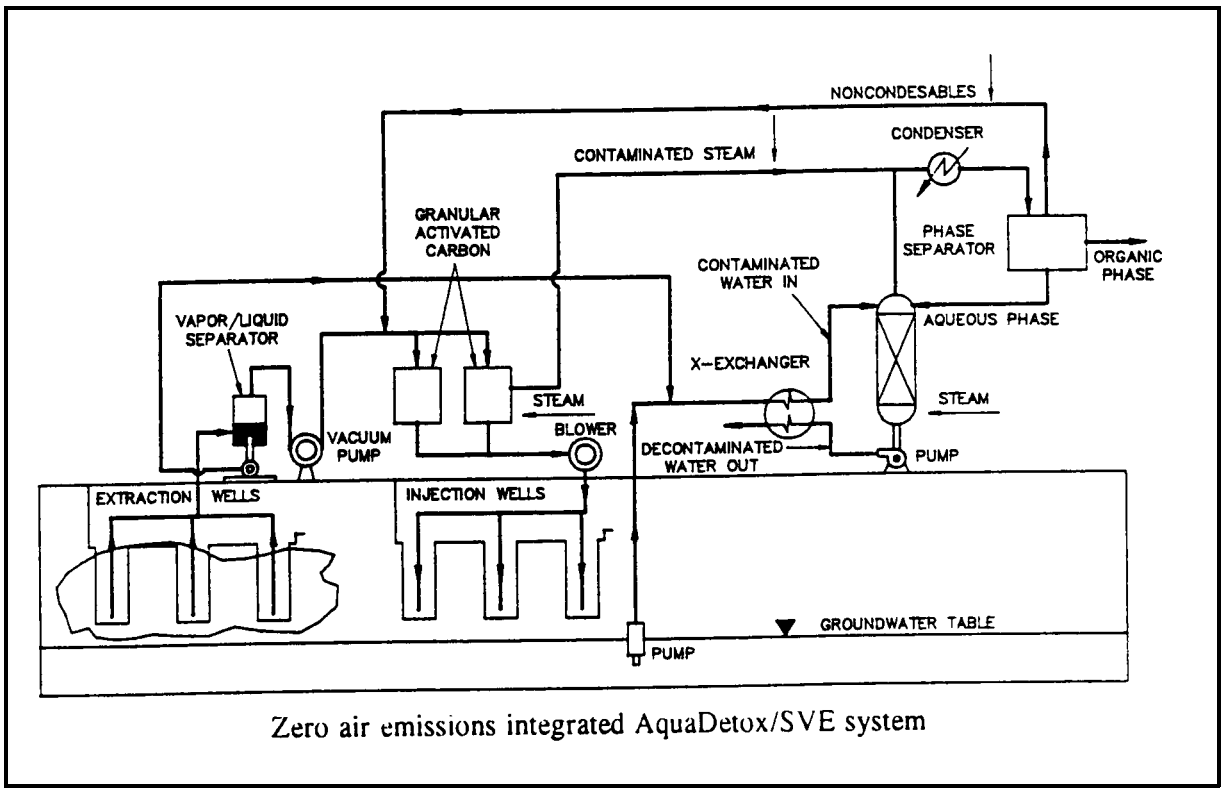
Physical/chemical treatment technologies use the physical properties of the contaminants or the contaminated medium to destroy, separate, or contain the contaminant. **Soil vapor extraction** takes advantage of the contaminant's volatility to separate it from the soil. **Soil flushing (or washing)** uses the contaminant's solubility in liquid to physically separate it from the soil. Surfactants may be added to the flushing solution to increase the solubility of a contaminant. **Ultraviolet/oxidation** techniques use ultraviolet light to catalyze the chemical oxidation of the organic contaminants.

Solidification/stabilization uses both physical and chemical means. Solidification encapsulates the contaminant, while stabilization involves physically altering or binding of contaminants. **Pneumatic fracturing** is an enhanced technique that physically alters the contaminated media's permeability by injecting pressurized air to develop cracks in consolidated materials.

EPA

- *Advanced Oxidation Processes for Treating Groundwater Contaminated with TCE (Trichloroethylene) and PCE (Tetrachloroethylene): Lab Studies*. Glaze and Kang. Water Engineering Research Laboratory, U.S. EPA, Cincinnati, OH. 1988.
  EPA/600/J-88/114

- *Applications Analysis Report (SITE Program): AWD Technologies-In Situ Vapor Extraction and Steam Vacuum Stripping*.
  EPA/540/A5-91/002



Zero air emissions integrated AquaDetox/SVE system

- *Applications Analysis Report (SITE Program): AWD Technologies-Integrated AquaDetox®/SVE Technology*.
  EPA/540/A5-89/003.

* • *Applications Analysis Report (SITE Program): Babcock and Wilcox Cyclone Furnace Vitrification Technology*.
  EPA/540/AR-92/017; NTIS: PB93-122315

- *Applications Analysis Report (SITE Program): BioTrol, Inc.-Soils Washing*.
  EPA/540/A5-91/003

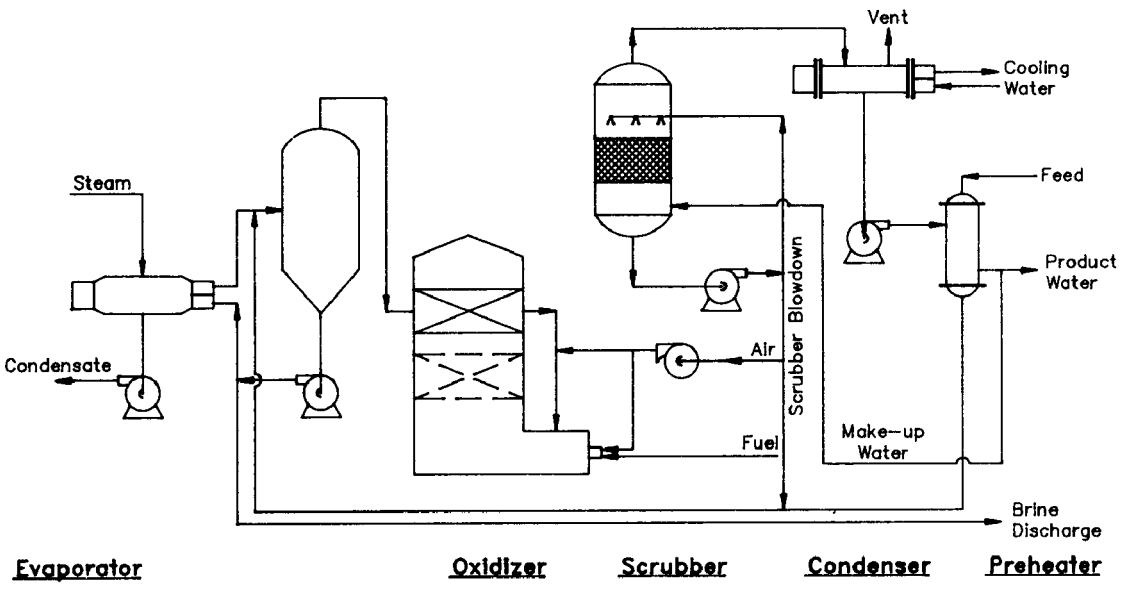
- *Applications Analysis Report (SITE Program): CF Systems Organics Extraction System, New Bedford, MA. Volume I*.
  EPA/540/5-90/002

- *Applications Analysis Report (SITE Program): CF Systems Organics Extraction System, New Bedford, MA. Volume II*.
  EPA/540/5-90/002a

- *Applications Analysis Report (SITE Program): Dehydrotech Corp.-The Carver-Greenfield Process*.
  EPA/540/AR-92/002; NTIS: PB93-101152

- *Applications Analysis Report (SITE Program): Dupont/Oberlin-Microfiltration Technology*.
  EPA/540/A5-90/007; NTIS: PB92-119023

* • *Applications Analysis Report (SITE Program): Magnum Water Technology Inc.-CAV-OX Ultraviolet Cavitation Oxidation Process*.
  EPA/540/AR-93/520; NTIS: PB94-189438



Basic PO*WW*ER™ Process

- *Applications Analysis Report (SITE Program): NOVATerra, Inc.-In Situ Steam/Hot Air Stripping*.
  EPA/540/5-90/008

* - *Applications Analysis Report (SITE Program): Perox-Pure- Chemical Oxidation Technology-Peroxidation Systems, Inc.*
  EPA/540/AR-93/501; NTIS: PB94-130325

* - *Applications Analysis Report (SITE Program): Pilot-Scale Demonstration of Slurry-Phase Biological Reactor for Creosote-Contaminated Soil*.
  EPA/540/A5-91/009; NTIS: PB94-124039

* - *Applications Analysis Report (SITE Program): PO*WW*ER- Evaporation Catalytic Oxidation Technology*.
  EPA/540/AR-93/506; NTIS: PB94-124658

* - *Applications Analysis Report (SITE Program): Resources Conservation Co.-The Basic Extractive Sludge Treatment (B.E.S.T.) Solvent Extraction System*.
  EPA/540/AR-92/079; NTIS: PB94-105434

* - *Applications Analysis Report (SITE Program): Retech, Inc.-Plasma Centrifugal Furnace (Final Report)*.
  EPA/540/A5-91/007; NTIS: PB92-218791

* - *Applications Analysis Report (SITE Program): SBP Technologies, Inc.-Membrane Filtration*.
  EPA/540/AR-92/014; NTIS: PB94-131646

- *Applications Analysis Report (SITE Program): Terra Vac-In Situ Vacuum Extraction System*.
  EPA/540/5-89/003 (Also available in videocassette from EPA, Edison, NJ)

- *Applications Analysis Report (SITE Program): Toxics Treatment, Inc.-In Situ Steam/Hot Air Soil Stripping*.
  EPA/540/5-90/003; NTIS: PB91-181768

- *Applications Analysis Report (SITE Program): Ultrox International-Ultraviolet Ozone Treatment for Liquids*.
  EPA/540/5-89/012

* - *Applications Analysis Report (SITE Program): U.S. EPA-Mobile Volume Reduction Unit*.
  EPA/540/AR-93/508; NTIS: PB94-130275

* - *Assessment and Remediation of Contaminated Sediments (ARCS) Program*.
  EPA/905/R-94/003

- *Catalytic Dehydrohalogenation: A Chemical Destruction Method for Halogenated Organics*.
  EPA/600/2-86/113

- *Chemical Destruction/Detoxification of Chlorinated Dioxins in Soils*. Peterson and Rogers. Proceedings, llth Annual Research Symposium, Cincinnati, OH. pp. 106-11. 1985. **EPA/600/9-85/028**

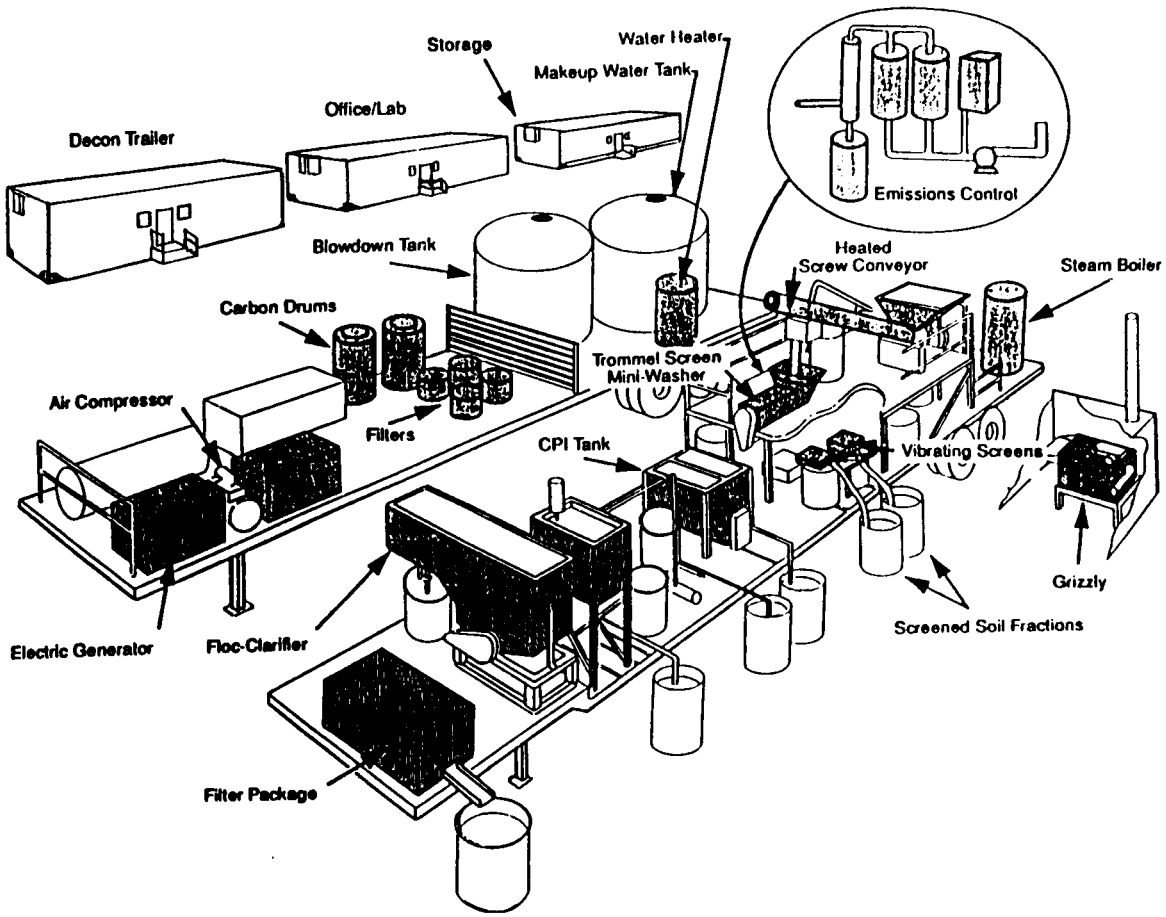
- *Cleaning Excavated Soil Using Extraction Agents: A State-of-the-Art Review*. **NTIS: PB 89-212757/AS**

- *Comprehensive Report on the KPEG Process for Treating Chlorinated Wastes*. **EPA/600/2-90/005; NTIS: PB 90-163643/AS**

- *Demonstration Bulletin (SITE Program): Bergman USA-Soil/Sediment Washing System*. **EPA/540/MR-92/075**

* - *Demonstration Bulletin (SITE Program): Colloid Polishing Filter Method, Flow Technology, Inc.* **EPA/540/MR-94/501**

* - *Demonstration Bulletin (SITE Program): Forager Sponge Technology*. **EPA/540/MR-94/522**



Typical VRU Operational Setup

* ● *Demonstration Bulletin (SITE Program): Fungal Treatment Technology..*
EPA/540/MR-93/514

* ● *Demonstration Bulletin (SITE Program): Gas-Phase Chemical Reduction, Ecologic International Inc.*
EPA/540/MR-93/522

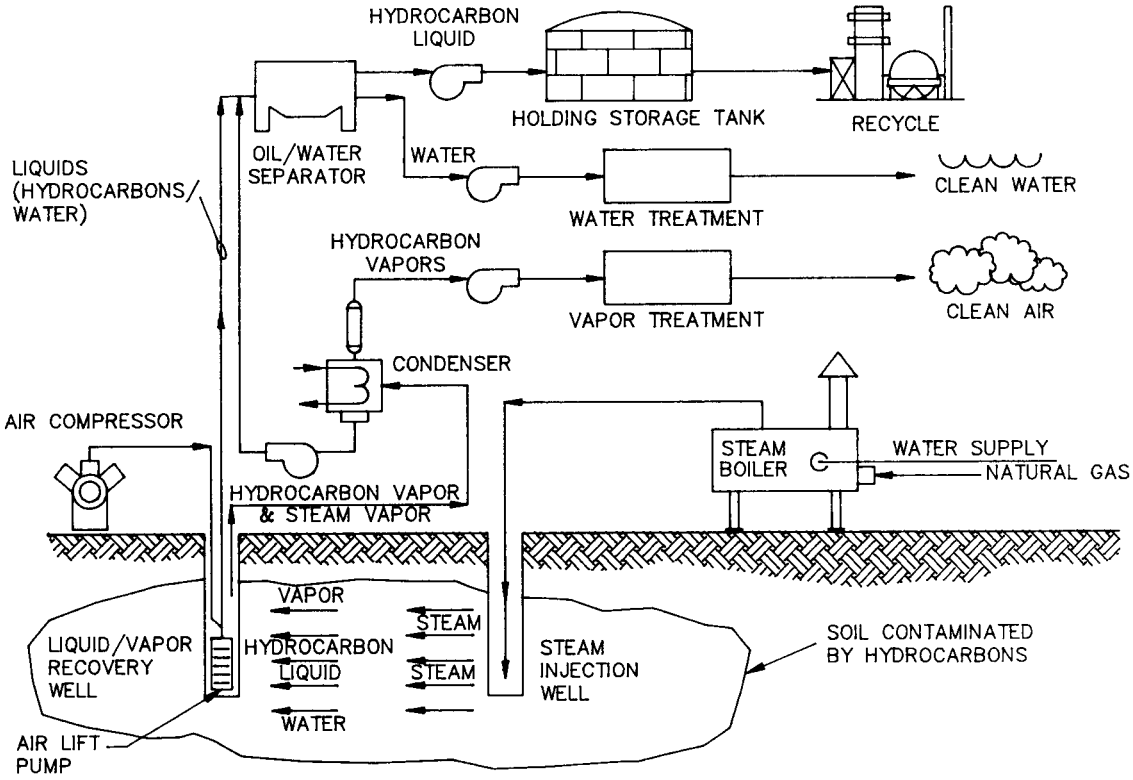
* ● *Demonstration Bulletin (SITE Program): Hrubetz Environmental Services, In Situ Thermal Oxidation Process.*
EPA/540/MR-93/524

* ● *Demonstration Bulletin (SITE Program): Hydraulic Fracturing of Contaminated Soil.*
EPA/540/MR-93/505

* ● *Demonstration Bulletin (SITE Program): In Situ Steam Enhanced Recovery System, Hughes Environmental Systems.*
EPA/540/MR-94/510

* ● *Demonstration Bulletin (SITE Program): In Situ Vitrification, Geosafe Corporation.*
EPA/540/MR-94/520

* ● *Demonstration Bulletin (SITE Program): Microfiltration Technology EPOC Water, Inc.*
EPA/540/MR-93/513



Steam Enhanced Recovery Process

- *Demonstration Bulletin (SITE Program): Resources Conservation Co.-The Basic Extractive Sludge Treatment (B.A.S.I.C.).*
  EPA/540/MR-92/079

- *Demonstration Bulletin (SITE Program): SBP Technologies-Membrane Microfiltration*.
  EPA/540/MR-92/014

* - *Demonstration Bulletin (SITE Program): Terra Kleen Solvent Extraction Technology-Terra Kleen Response Group, Inc.*
  EPA/540/MR-94/521

* - *Demonstration Bulletin (SITE Program): Texaco Gasification Process, Texaco Inc.*
  EPA/540/MR-94/514

- *Demonstration Bulletin (SITE Program): Toronto Harbour Commissioners-Soil Recycling Treatment Train.*
  EPA/540/MR-92/015

- *Destruction of Chlorinated Hydrocarbons by Catalytic Oxidation*. Joint EPA and AFESC Report published by EPA.
  EPA/600/2-86/079

- *Development of Electroacoustical Soil Decontamination (ESD) Process for In Situ Application*.
  EPA/540/5-90/004

- *Development of Chemical Countermeasures for Hazardous Waste Contaminated Soil*.
  EPA/600/D-84/039

- *Engineering Bulletin: Chemical Dehalogenation-APEG Treatment*.
  EPA/540/2-90/015

- *Engineering Bulletin: Chemical Oxidation Treatment*.
  EPA/540/2-91/025

- *Engineering Bulletin: In Situ Soil Flushing*.
  EPA/540/2-91/021

- *Engineering Bulletin: In Situ Soil Vapor Extraction*.
  EPA/540/2-91/006

- *Engineering Bulletin: In Situ Steam Extraction*.
  EPA/540/2-91/005

* - *Engineering Bulletin: In Situ Vitrification Treatment*.
  EPA/540/S-94/504; NTIS: PB95-125499

- *Engineering Bulletin: Soil Washing Treatment*.
  EPA/540/2-90/017

- *Engineering Bulletin: Solvent Extraction Treatment*.
  EPA/540/2-90/013

- *Engineering Bulletin: Supercritical Water Oxidation*.
  EPA/540/S-92/006

- *Evaluation of BEST™ Solvent Extraction Sludge Treatment Technology 24-Hour Test*.
  NTIS: PB88-245907

- *Evaluation of Soil Venting Application*.
  EPA/540/S-92/004; NTIS: PB92-232362

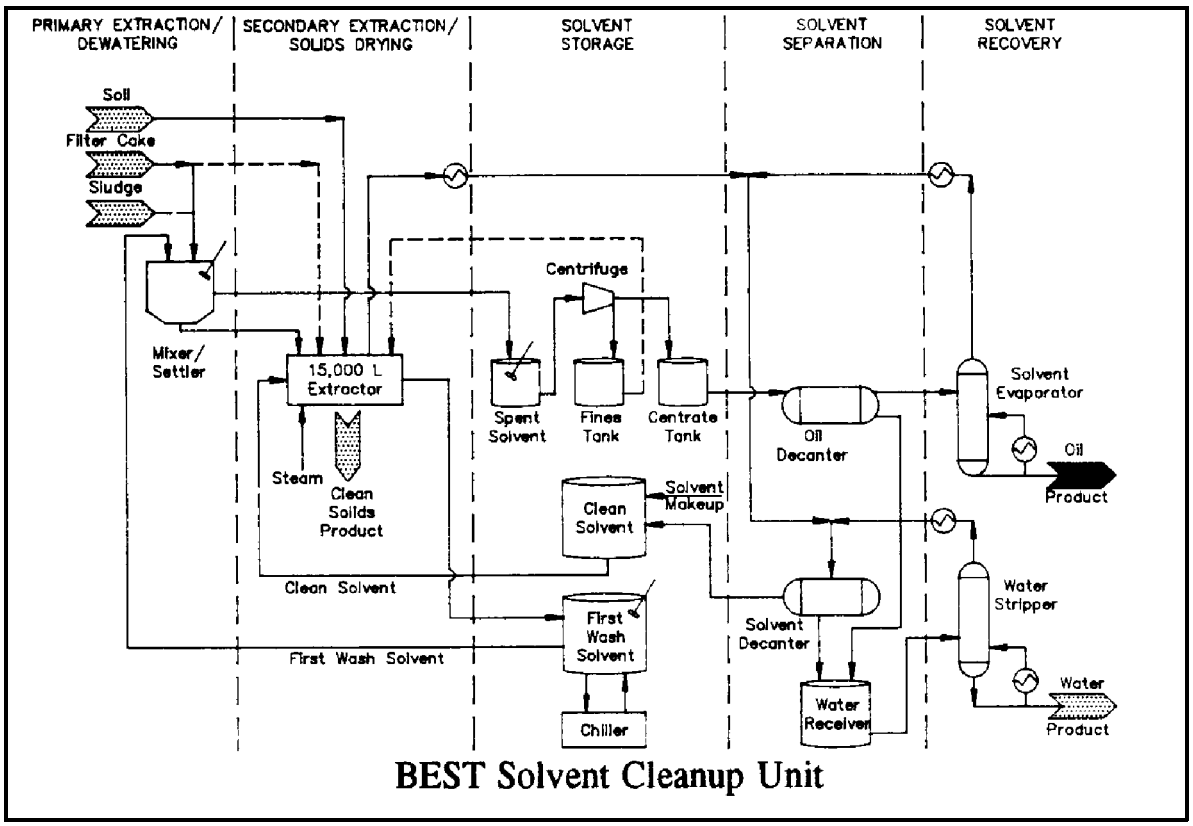
- *Field Applications of the KPEG Process for Treating Chlorinated Wastes*.
  EPA/600/2-89/036

- *Field Studies of In Situ Soil Washing*. Nash, J.H., Mason and Hanger-Silas Mason Co., Inc., Leonardo, NJ. Hazardous Waste Engineering Research Laboratory, U.S. EPA, Cincinnati, OH. Dec. 1987.
  EPA/600/2-87/110; NTIS: PB88-146808/XAB

- *Innovative Technology: BEST Solvent Extraction Process*.
  OSWER Directive 9200.5-253-FS (Fact Sheet)

- *Innovative Technology: Glycolate Dehalogenation*.
  OSWER Directive 9200.5-254-FS (Fact Sheet)

- *Innovative Technology: Soil Washing*.
  OSWER Directive 9200.5-250-FS (Fact Sheet)



BEST Solvent Cleanup Unit

- *Interim Report on the Feasibility of Using UV (Ultraviolet) Photolysis and APEG (Alkali Poly-ethylene Glycolate) Reagent for Treatment of Dioxin Contaminated Soils*.
  EPA/600/2-85/083

- *Method for the Supercritical Fluid Extraction of Soils/Sediments*.
  EPA/600/4-90/026; NTIS: PB91-127803/CCE

- *Mobile System for Extracting Spilled Hazardous Materials from Excavated Soils*.
  EPA/600/2-83/100

- *PCB Destruction: A Novel Dehalogenation Reagent*.
  EPA/600/J-85/407

- *Report on the Feasibility of APEG: Detoxification of Dioxin-Contaminated Soils*.
  EPA/600/2-84/071

- *Sequential Dehalogenation of Chlorinated Ethenes*.
  EPA/600/J-86/030

- *Soil Vapor Extraction Technology: Reference Handbook*.
  EPA/540/2-91/003

- *State of Technology Review: Soil Vapor Extraction Systems*.
  NTIS: PB 89-195184

- *Technology Evaluation Report — U.S. EPA, RREL: Debris Washing System*.
  EPA/540/5-91/006

- *Treating Chlorinated Wastes with the KPEG Process*.
  EPA/600/S2-90/026

- *Treatment of Contaminated Soils with Aqueous Surfactants*. Ellis, W.D., *et al*. 1985.
  EPA/600/2-85/129

- *U.S. EPA's Mobile In Situ Containment/Treatment Unit*.
  Videocassette from EPA, Edison, NJ

- *U.S. EPA's Mobile Soil Washing System*.
  Videocassette from EPA, Edison, NJ

* - *Vitrification Technologies For Treatment of Hazardous and Radioactive Waste*.
  EPA/625/R-92/002; NTIS: PB92-201110

DOE

- *Analytical Solutions for Steady State Gas Flow to a Soil Vapor Extraction Well in the Unsaturated Zone*. Shan, C., *et al*. Lawrence Berkeley Laboratory, DOE, Berkeley, CA. 1991.
  LBL-30924

- *Application of Soil Venting at a Large Scale: A Data and Modeling Analysis*.
  NTIS: DE91001995/XAB

* - *Chromate Reduction and Heavy Metal Fixation in Soil*. Office of Technology Development. 1992.
  NTIS: DOE/CH-9214

* - *Combined Air Stripping/Membrane Vapor Separation Systems*. Office of Technology Development. 1992.
  NTIS: DOE/CH-9209

- *Cryogenic Barrier Enhanced Soil Cleanup, A Literature Review*. University of Idaho.
  EG&G Report to be published (Contact DOE, Idaho National Engineering Laboratory.)

- *An Evaluation of the Use of an Advanced Oxidation Process to Remove Chlorinated Hydrocarbons from Groundwater at the U.S. Department of Energy Kansas City Plant. FY 1989 Annual Report*. Garland and Payton. Oak Ridge National Laboratory, DOE, TN. Oct. 1990.
  ORNL/TM-11337

- *An Evaluation of the Use of a Combination of Ozone-Ultraviolet Radiation and Hydrogen Peroxide to Remove Chlorinated Hydrocarbons from Groundwater at the U.S. Department of Energy Kansas City Plant. FY 1988 Annual Report*. Garland, S.B. II. Oak Ridge National Laboratory, DOE, TN. May 1989.
  ORNL/TM-11056; NTIS or OSTI: DE89015678

- *Feasibility Testing of In Situ Vitrification on Arnold Engineering Development Center Contaminated Soils*. Timmerman, C.L. Pacific Northwest Laboratory, DOE, Richland, WA. Mar. 1989.
  ORNL/Sub-88-14384/1; NTIS or OSTI: DE89008976

- *In Situ Air Stripping: Cost Effectiveness of a Remediation Technology Field Tested at Savannah River Integrated Demonstration Site*.
  LA-UR-92-1927

- *In Situ Vitrification: A Review*. Cole and Fields. Oak Ridge National Laboratory, DOE, TN. Nov. 1989.
  ORNL/TM-11293; NTIS or OSTI: DE90003379

- *In Situ Vitrification, Heat and Immobilization are Combined for Soil Remediation*. Fitzpatrick and Hansen. Geosafe Corp., Kirkland, WA. Hazmat World. 2(12): 30-34. Dec. 1989.
  No published document number.

- *In Situ Vitrification of PCB (Polychlorinated Biphenyl)-Contaminated Soils: Final Report*. Timmerman, C.L. Pacific Northwest Laboratory, DOE, Richland, WA. Oct. 1986.
  EPRI-CS-4839; NTIS or OSTI: DE87003328

- *In Situ Vitrification: Test Results for a Contaminated Soil-Melting Process, Supplement 1*. Buelt, J.L., *et al*. Pacific Northwest Laboratory, DOE, Richland, WA. Oct. 1989.
  PNL-SA-15767-Suppl. 1; NTIS or OSTI: DE90005231

- *In Situ Vitrification of Transuranic Wastes: An Updated Systems Evaluation and Applications Assessment*. Buelt, J.L., *et al*. Pacific Northwest Laboratory, DOE, Richland, WA. Mar. 1987.
  PNL-4800-Suppl. 1; NTIS or OSTI: DE87007356

- *Remediation of Contaminated Soil Using Heap Leach Mining Technology*. Tork and Aamodt. Los Alamos National Laboratory, DOE, NM. 1990.
  LAUR-90-701; NTIS or OSTI: DE90007510

- *Steam Stripping and Batch Distillation for the Removal/Recovery of Volatile Organic Compounds*. Hassan and Herrin. Dept. of Civil and Environmental Engineering, Cincinnati University, Cincinnati, OH. 1989.
  NTIS: PB 89-218796/XAB

DOI

- *Acid Leach Processing of an Arsenic-Containing Copper Waste*. Gritton and Gebhardt. Published in Proceedings of the Western Regional Symposium on Mining and Mineral Processing Wastes, Berkeley, CA, May 30 - June 1, 1990.
  No published document number.

- *Alternatives for Treatment of Arsenic-Containing Copper Industrial Bleed Streams*. Gritton and Gebhardt. Published in Proceedings of the COPPER 91 — COBRE 91 International Symposium, Ottawa, Canada, August 18-21, 1991.
  No published document number.

- *Copper Extraction from Aqueous Solutions with Liquid Emulsion Membranes: A Preliminary Laboratory Study*. Nilsen, D.N., *et al*. Bureau of Mines Report of Investigation 9375, 1991.
  No published document number.

- *Development and Evaluation of a Laboratory-Scale Continuous Circuit for the Extraction of Copper with Emulsion Membranes in Hydrometallury and Electrometallurgy of Copper*. Nilsen and Hundley. Published in Proceedings of the Copper 91-Cobre 91 International Symposium, Ottawa, Canada, August 18-21, 1991.
  No published document number.

- *Evaluation of the Performance of a Laboratory-scale Continuous Circuit for the recovery of Copper*. Nilsen and Hundley. Presented at an "Open Industry Briefing," Annual Meeting of the Arizona Section of AIME, Tucson, Arizona, Dec. 6-7, 1992.
  No published document number.

- *Extraction of Cu from Mine Drainage Solution with Liquid Emulsion Membranes: A Preliminary Laboratory Study*. Nilsen and Stubbs. Presented at Pacific NW Metals and Minerals Conference, Portland, Oregon, April 22-24, 1990.
  No published document number.

- *Liquid Emulsion Membrane for Wastewater Cleanup* (Briefing Sheet). O'Hare and Nilsen. 1992.
  No published document number.

- *Metal Recovery from Acid-Leach Processing of Arsenic-Containing Copper Wastes*. Steele and Gritton. Presented at the 1991 SME Annual Meeting.
  No published document number.

- *Metal Recovery from Metallurgical Wastes*. Gritton, K.S., *et al*. Presented at the SME Annual Meeting. 1990.
  No published document number.

- *Selenium Removal with Ferrous Hydroxide*. Moody and Murphy. Proceedings of Toxic Substances in Agricultural Water Supply and Drainage, U.S. Committee on Irrigation and Drainage, pp. 231-241. Jun. 1989.
  Available from Bureau of Reclamation

U.S. Air Force

- *In Situ Decontamination by Radiofrequency Heating — Field Test*. Dev, H., *et al*. Sept. 1989.
  ESL-TR-88-62; NTIS: AD-A221 186/0/XAB

- *Radio Frequency/Vapor Extraction Technology To Treat Hydrocarbons in Soil*. Looney, B. Savannah River Plant, Aiken, SC. 1992-93.
  No published document number.

- *Removal of Volatile Organics from Humidified Air Streams by Absorption*. Coutnat, R.W., *et al*. Dec. 1987.
  ESL-TR-87-24

- *Surfactant-Enhanced In Situ Soils Washing*. Nash, J., *et al*. Sept. 1987.
  ESL-TR-87-18; NTIS: AD-A188 066/5/XAB

- *Vapor-Phase Catalytic Oxidation of Mixed Volatile Organic Compounds*. Greene, H. University of Akron, Akron, OH. Sept. 1989.
  ESL-TR-89-12

U.S. Army

- *Adsorption and Desorption of Dinitrotoluene on Activated Carbon*. U.S. Army Environmental Center. Aug. 1987.
  CETHA-TS-CR-91048

- *Arsenic Contaminated Treatment Pilot Study at the Sharpe Army Depot (SHAD) Lathrope, CA: Final Technical Report*. U.S. Army Environmental Center. Dec. 1990.
  CETHA-TS-CR-90184

- *Bench-Scale Investigation of Air Stripping of Volatile Organic Compounds from Soil: Technical Report*. McDevitt, N.P., *et al*. U.S. Army Environmental Center. Aug. 1986.
  AMXTH-TE-CR-86092

- *Demonstration Testing of Plastic Media Blasting (PMB) at Letterkenny Army Depot*. U.S. Army Environmental Center. Jan. 1989.
  No published document number.

- *Draft Final Report for Pilot Demonstration of an Air Stripping Technology for the Treatment of Groundwater Contaminated with Volatile Organic Compounds at Sharpe Army Depot*. U.S. Army Environmental Center.
  CETHA-TS-CR-91071

- *Engineering and Development Support of General Decontamination Technology for the DARCOM Installation Restoration Program Task 4. Desensitization of Explosive-Laden Soils/ Sediments, Phase II — Lab Studies*. U.S. Army Environmental Center. Mar. 84-Nov. 85.
  DRXTH-TE-CR-83207; NTIS: AD-A162 456/8/XAB

- *Evaluation of Ultraviolet/Ozone Treatment of Rocky Mountain Arsenal (RMA) Groundwater*. Buhts, R., *et al*. U.S. Army Corps of Engineers Waterways Experiment Station Technical Report. 1978.
  Report No. Y-78-1

- *Final Technical Report: Bench Scale Investigation of Low Temperature Thermal Stripping of Volatile Organic Compounds (VOCs) from Various Soil Types*. U.S. Army Environmental Center. Nov. 1987.
  AMXTH-TE-CR-87124

- *Final Technical Report: Demonstration of Thermal Stripping of JP-4 and Other VOCs from Soils at Tinker Air Force Base, Oklahoma City, Oklahoma*. U.S. Army Environmental Center. March 1990.
  CETHA-TE-CR-90026

- *Final Technical Report: Economic Evaluation of Low Temperature Thermal Stripping of Volatile Organic Compounds from Soil*. U.S. Army Environmental Center. Aug. 1986.
  AMXTH-TE-CR-86085

- *Final Technical Report: Pilot Investigation of Low Temperature Thermal Stripping of Volatile Organic Compounds from Soil (2 Vols)*. U.S. Army Environmental Center. June 1986.
  AMXTH-TE-TR-86074

- *Final Technical Report: Use of Activated Carbon for Treatment of Explosive-Contaminated Groundwater at the Badger Army Ammunition Plant (BAAP)*. U.S. Army Environmental Center. Aug. 1989.
  CETHA-CR-89216

- *Final Technical Report: Use of Activated Carbon for Treatment of Explosive-Contaminated Groundwater at the Milan Army Munitions Plant (MAAP)*. U.S. Army Environmental Center. May 1990.
  CETHA-CR-90041

- *Heavy Metal Contaminated Soil Treatment*. Roy F. Weston, Inc. U.S. Army Environmental Center. Feb. 1987.
  AMXTH-TE-CR-86101

- *In Situ Air Stripping of Soils Pilot Study: Final Report*. Anastos, G.J., *et al*. U.S. Army Environmental Center. Oct. 1985.
  AMXTH-TE-TR-85026

- *In Situ Volatilization Remedial System Cost Analysis: Technical Report*. Metzer, N., *et al*. U.S. Army Environmental Center. Aug. 1987.
  AMXTH-TE-CR-87123

- *Laboratory Study of In Situ Volatilization Technology Applied to Fort Campbell Soils Contaminated with JP-4: Final Report*. Marks, P., *et al*. U.S. Army Environmental Center. May 1987.
  No published document number.

- *Laboratory Study of In Situ Volatilization Technology Applied to Letterkenny Army Depot Soils*. U.S. Army Environmental Center. Mar. 1988.
  AMXTH-TE-CR-88009

- *Soil Washing Development Program and Demonstration Test on Basin F Materials*. Arthur D. Little, Inc. U.S. Army Environmental Center. May 1988.
  AMXTH-TE-CR-86016

- *Technical and Economic Evaluation of Air Stripping for Volatile Organic Compound (VOC) Removal from Contaminated Groundwater at Selected Army Sites*. Tennessee Valley Authority National Fertilizer and Environmental Research Center, Muscle Shoals, AL. Jul. 1991.
  CETHA-TE-91023

- *Use of Vapor Extraction Systems for In Situ Removal of Volatile Organic Compounds from Soil*. Bennedsen, H.B., *et al*. U.S. Army Environmental Center. Mar. 1987.
  No published document number.

U.S. Navy

- *Advanced Oxidation Process for Treatment of Contaminated Groundwater*. Olah and Law. Naval Civil Engineering Laboratory. 71-080 20#T357104.
  TM-71-90-2

- *Chemical Dehalogenation Treatment: Base-Catalyzed Decomposition Process (BCDP)*. Chan, D.B. Naval Civil Engineering Laboratory. Aug. 1991.
  No published document number.

- *Demonstration of PCB Dechlorination Using Base-Catalyzed Decomposition*. Rogers, C. Naval Civil Engineering Laboratory. Oct. 1990.

No published document number.

- *Evaluation of Combined Treatment Technology for Navy Remediation Site Groups (PACT Process)*. Barber and Canter. Environmental and Ground Water Institute, University of Oklahoma. Dec. 1989.
  No published document number.

- *Evaluation of Photochemical Oxidation Technology for Navy Remediation Site Groups*. Paul and Canter. University of Oklahoma. Dec. 1989.
  No published document number.

- *Evaluation of Processes to Chemically Treat PCBs and Hazardous Materials*. Hinchee, R.E., *et al*. Naval Civil Engineering Laboratory. Dec. 1989.
  No published document number.

- *Initial Feasibility Report: Investigation of Photochemical Oxidative Techniques for Treatment of Contaminated Groundwater*. Olah and Law. Naval Civil Engineering Laboratory. 71-080.
  TM-71-90-9

* - *Terra-Kleen Extraction Technology: An Innovative Method for Treating PCBs in Soil*. Naval Air Station North Island Environmental Department, San Diego, CA. January 1995.
  NAS North Island: NELP Fact Sheet No. 2

- *Test Report: KPEG Process for Treating Chlorinated Wastes*. PEI Associates. Sept. 1989.
  No published document number.

- *Treatment of Navy Landfill Leachate Contaminated with Low Levels of Priority Pollutants*. Jue and Regan. Naval Civil Engineering Laboratory. Oct. 1991.
  No published document number.

H. COMMUNITY RELATIONS

EPA

- *A Citizen's Guide To Innovative Treatment Technologies for Contaminated Soils, Sludges, Sediments, and Debris*.
  EPA/542/F-92/001
  EPA/542/f-92/014 (Spanish)

- *A Citizen's Guide To How Innovative Treatment Technologies Are Being Successfully Applied at Superfund Sites*.
  EPA/542/F-92/002
  EPA/542/F-92/015 (Spanish)

- *A Citizen's Guide To Soil Washing*.
  EPA/542/F-92/003
  EPA/542/F-92/016 (Spanish)

- *A Citizen's Guide To Solvent Extraction*.
  EPA/542/F-92/004
  EPA/542/F-92/017 (Spanish)

- *A Citizen's Guide To Glycolate Dehalogenation*.
  EPA/542/F-92/005
  EPA/542/F-92/-18 (Spanish)

- *A Citizen's Guide To Thermal Desorption*.
  EPA/542/F-92/006
  EPA/542/F-92/019 (Spanish)

- *A Citizen's Guide To In Situ Soil Flushing*.
  EPA/542/F-92/007
  EPA/542/F-92/020 (Spanish)

- *A Citizen's Guide To Bioventing*.
  EPA/542/F-92/008
  EPA/542/F-92/021 (Spanish)

- *A Citizen's Guide To Using Indigenous and Exogenous Microorganisms in Bioremediation*.
  EPA/542/F-92/009
  EPA/542/F-92/022 (Spanish)

- *A Citizen's Guide To Air Sparging*.
  EPA/542/F-92/010
  EPA/542/F-92/023 (Spanish)

- *Understanding Bioremediation: A Guidebook for Citizens*.
  EPA/540/2-91/002
  EPA/542/F-92/024 (Spanish)

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